

THE FEDERAL WATER-POWER POLICY

By

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## CONTENTS

<u>Chapters</u>	<u>Page</u>
I Introduction	1
II Economic Aspects of Power Development	19
III The Economic Aspects of Water-power Development	34
IV Public Regulation of Hydro-electric Projects	46
V Government Ownership versus Private Ownership and Regulation	61
VI State versus Federal Regulation and Control of Water-power Development and Operation	79
VII Federal Regulation of Water-power Prior to 1920	100
VIII The Water-Power Act of 1920	126
IX Suggestions for a Federal Power Policy	145
X The Great Power Projects	160

## CHAPTER I

### INTRODUCTION

American industrial establishments use a greater amount of mechanical power, per worker, than is used by the industries of any other country. Various theories have been advanced to account for the widespread use of power machinery in America. Still other theories have been developed to explain the apparent effects of its use. It has been found that, invariably, there is a low rate of power consumption in countries where the rate of wages is low and that high power consumption accompanies high wages.

Many who are in contact with industry have come to believe that the high wages obtaining in the United States are the direct result of the amount of power used here. Engineers are especially strong in their belief that power consumption is a determining factor among the many which affect wages. There is a relation between wages and power consumption but no recognized economic theorist has been deceived by the apparent relation between them.

Economists are convinced that the high wage level in the United States is due to the abundance of excellent agricultural land which, until recently, could be had almost for the asking. Manufacturers have competed with cheap land by paying high wages, but at the same time they

have spread labor as thinly as possible by the use of power machinery. High wages, therefore, stimulate those who are responsible for the installation of power equipment. They are the cause of power installations rather than the effects of them.

Even though high wages are responsible for the introduction of mass production they cannot be maintained without the continued use of power machinery. Population is increasing and the law of diminishing productivity will beat the wage rate <sup>down</sup> to the subsistence level if it is not counteracted in some way or other.

Economists and engineers finally come to the same conclusion, though by different routes. Both are agreed that mechanical power is one of the chief supports of modern civilization and that it will increase, rather than decrease, in importance. Socially-minded government officials and private citizens have long been interested in problems connected with the methods of power generation and consumption together with the prospects for an adequate and unfailing future supply of power.

A part of this interest has been dissipated in more or less idle speculation, but for the most part power problems have been tackled by practical-minded men who have managed to keep their feet on the ground.



## POWER PROBLEMS

Power is now secured from two main sources. By far the larger part of the power used in industry is secured from controlled combustion, but power to the extent of several million horsepower is generated by means of flowing or falling water. Combustion depends upon a supply of fuel, and power can be secured from fuels only so long as fuel is available. Coal is the most important fuel.

The consumption of enormous quantities of coal to supply energy for the factories, the railroads, and other users in the United States has created several very important problems. It is evident that better methods are needed when railroads are frequently choked with coal; when mechanical devices waste a very large part of the energy of the fuel consumed; and, when mining methods are so wasteful that a large part of the coal seam, being mined, is left in the ground.

Although large reserves of coal still exist, it is a wasting resource which cannot be replaced, once it has been used up. The end of the coal supply is scarcely in sight, but waste cannot be condoned because of abundance at the present moment. Waste is a loss and losses are expensive. Past mistakes are being corrected as rapidly as they are recognized as mistakes, but there is

little consistency in the process of betterment.

Four hundred million tons of coal are mined in the United States every year. Practically as much more coal is permanently destroyed by unscientific mining methods. Eight hundred million tons per year is a heavy drain upon the coal reserves.

Geologists have estimated that the known beds of coal in the United States will last between five hundred and two thousand years. There is, then, no need for the present generation to fear coal exhaustion. It may be unwise to plan for the well-being of people who will live five or six hundred years from now, just as it is practically certain that any program of conservation entailing any great expenditure will result in financial loss. Whatever the financial aspects of conservation may be, some satisfaction is to be achieved by refraining from looting the storehouse out of which future generations must live. Little is to be gained permanently by squandering coal in order that industrialists may save a few dollars.

#### ELECTRIFICATION AND CONSERVATION

A great change is taking place in the power industry. Within the last few years the use of electricity as a medium for power distribution has spread so rapidly that the entire power situation has been changed. Year by

year a greater number of mills and factories come to rely upon electric power. Each year we see more miles of railroad electrified. Electric utility companies are growing rapidly and spreading their net-work of transmission lines to villages and farmsteads which, until recently, secured their light and power from other sources. Kilowatt hour consumption has mounted from a paltry one hundred and seventy-five millions in 1870 to fifty-eight billions in 1924. Large as this latter figure is, the saturation point must be far off, as the rate of increase continues with but little diminution. Specialization has made its appearance in the power field with the result that manufacturers are buying power from great central stations, rather than generating it at their own plants. Separation of ownership of power-generating and power-consuming units has been progressing very rapidly in the last five years and is more responsible for the increased use of electricity than any extension of domestic use.

Conservation of coal is being effected by electrical development. Where coal must be used to generate power, efficient centralized power systems are rapidly replacing the inefficient individual power units. Two economies result from centralization. Less coal is needed to produce a given amount of power and the power generated is distributed by transmission lines which reduces the con-

gestion caused by heavy shipments of coal by rail. Economies in the use of coal are also supplemented by the greater use of water-power, which electrification has made possible.

Electricity has proved itself to be such a superior medium for power transmission that there is little need to campaign for its greater use in the interest of conservation. In fact, it is spreading as rapidly as is compatible with sound construction.

#### WATER-POWER AS A SUBSTITUTE FOR STEAM-POWER

Water-power is a very satisfactory substitute for steam wherever it may be used. Any increased use of water-power will decrease the drain upon the coal reserves and may, at the same time, result in actual savings over the cost of steam-generated power. Some very zealous conservationists are advocating the use of water-power in order that coal may be saved. Those who are most enthusiastic believe that wonderful results will come from a greater and greater use of an unfailing source of power. More temperate conservationists have not been carried away by unproved statements. The latter have recognized the legitimacy and the strength of the appeals which have motivated enterprisers when they have chosen their sources of power.

In spite of a great deal of talking about the advantages that might be gained by the use of water-power, enterprisers have hesitated to invest heavily in water-power projects. Some of the reasons for this condition are to be found in causes that are contemporary, while others have persisted since the Industrial Revolution. A history of water-power development might be written to trace the forces which have shaped the development of water-power, but a short sketch is sufficient to outline the course of its growth, decay, and rejuvenation.

#### PERIODS IN THE HISTORY OF WATER-POWER DEVELOPMENT

Water-power development has passed through four stages since the first attempts were made to use it. The first stage lasted until the Industrial Revolution. Steam-power and a successful steam engine marked the termination of the second period and the beginning of the third period. Electrical generation ushered in the fourth stage of water-power development. The transition from one period to another has been marked by a change in outlook and industrial influence, rather than by any great change in the rate at which development has been carried on.

No one seems to know when or where water was first used for power generation. The early Egyptians built large vertical wheels and used them for lifting water to

irrigate their fields along the Nile River. It is known that similar pumping devices were used in the Euphrates Valley and in many places in China.<sup>1</sup> No doubt, many other peoples knew how to make use of water-power. Early types of water-wheels were crudely constructed and were very inefficient, when compared with the modern turbine runner or the Pelton wheel, but were admirably suited to the conditions and circumstances under which they were used. In various parts of the Orient descendants of the old power devices are used to lift water for the paddy-fields in much the same way that their forerunners did two or three thousand years ago.

At a later date the Roman millers began to use water-wheels to turn the stones in their mills.<sup>2</sup> Other peoples of Europe recognized the utility of the water-wheel used by the Romans. Water-propelled mills, therefore, became common in Europe before the Middle Ages and almost every village and hamlet had a mill to grind the corn of both lord and serf. Mills were quite frequently used by the lords as sources of revenue. The serf was compelled to have his grain ground at the lord's mill and the toll was a source of income for his master.

<sup>1</sup>Glynn, Joseph, F.R.S., Rudimentary Treatise on Power of Waters, pg. 5.

<sup>2</sup>Ibid., pg. 3.

Household industry was well established in England long before the inventions of Hargreaves, Arkwright, Crompton, and others changed the hand operations, which had been used for generations, to machine operations. Ambitious spinners and weavers soon adapted the new machines to power operation which increased the demand for water-power. Large quantities of water are normally used in the various processes of cloth making and this added use for water increased the advantages of the North counties of England, because of the large number of small streams to be found there. Clothmakers migrated to the North counties and set up their factories along the streams. As the English cloth industry grew and prospered, water-power became one of the dominant factors in shaping the character of localized industry within England.

Clothmakers were not the only ones who recognized the usefulness of water-power. Water-wheels were put to other uses. They blew iron furnaces; pumped water from the mines; and did many other things that had formerly been done by manual labor. Power machinery gave English industrialists such a great advantage over manufacturers in other countries that power was sought after eagerly. It was not until the invention of the steam engine that water-power ceased to dominate.

Steam engines were used chiefly in the foundry

and mining industries while Watt's patent was in force, but later they gradually took over the power burden of industry. During the third stage of water-power development many scientists and inventors were making exhaustive studies of ways to improve the efficiency of water-wheels in order that they might continue to compete with steam. Most noteworthy of the results were the works of Messrs. Smeaton of England, Fourneyron of France, and Boyden of Massachusetts.

Despite the important contributions to the knowledge of water-wheel construction, water-power gradually lost its ascendancy as steam-power became more dependable. Each improvement in steam engines tended to lower their costs of operation. Improvements in steam engines affected economies in industry and in transportation, all of which made the use of steam still more economical, chiefly by lowering the cost of coal. Cheap coal is the foundation upon which steam-powered industry has been built and without which it cannot continue.

#### ADVANTAGES OF THE STEAM ENGINE OVER WATER POWER

Relative cheapness was not the only reason for installing steam engines. Steam units are very flexible, both as regards size and location, which enables factory owners to locate near raw materials, transportation



facilities, or their market. They are not compelled to locate near some remote stream.

Revolutionary changes have taken place in the technique of industry, of trade, and of the manner of living in countries in which there has been a tremendous increase in the use of steam. Specialization has been carried to extremes undreamed of by Adam Smith. Great cities have been built far from their sources of raw materials and their markets. Many cities, if not all of them, depend upon cheap transportation for their continued existence.

Steam-power has always been very strongly entrenched in the United States. Coal has been abundant and cheap in America and manufacturing did not develop to any extent until after the Colonies separated from England. Water-power was used very early, but it could not withstand the steady competition of steam. One by one the mills began to be run by steam until only those were left to water-power which required a great deal of water in their manufacturing processes. It was not until the generation and transmission of electricity became commercially possible that water-power ceased to be of more than local importance.

#### WATER POWER AND ELECTRIC TRANSMISSION

Electric transmission definitely ushered in a

new and last period in water-power development. Water-power projects were small affairs before electricity came to be used. Whenever it was considered advantageous to use water-power to run a mill, the mill was built upon the banks of the stream which was to run it or the water was conducted to the mill by means of a power canal. Water-wheels could not be located at any great distance from the machinery they were expected to drive, since it was necessary to have a mechanical connection between the wheel and the machines.

Mechanical connection could be effected either by means of line shafting, sometimes called a tumbling rod, or by a wire rope belt drive. Whichever method was used, the wheel could not be over one or two hundred yards away, if the drive was to be efficient.

Large rivers were not developed before the commercial use of electricity because of the presence of small streams which could be harnessed much more cheaply and effectively than the larger ones. There were few, if any, establishments large enough to use the power one of the larger rivers could generate and, since the power could not be transported and sold elsewhere, none but rash men considered such projects at all.

Despite practical difficulties, many plans have been drawn up to use some of the larger power sites. A

few sanguine individuals were impressed by the power possibilities of Niagara Falls long before electricity demonstrated its superiority as an agent for transmitting power from one place to another. Several non-electrical plans were drawn up by individuals who thought that an attempt should be made to utilize a part of the power of the Niagara River and that it would be feasible to transmit a part of the power some distance from the Falls. As late as 1880 engineers were considering a scheme for using moving cables to transmit power to industrial plants located nearby. Engineers were also considering a system of piping for hydro or pneumatic power transmission.<sup>1</sup> In 1880, more than ten years after Professor H. A. Rowland of the Johns Hopkins University had invented the continuous current generator<sup>2</sup>, engineers were still seriously considering other forms of power transmission. Despite its tardy recognition, the age of electricity dates from the continuous current generator, but it was not until the induction motor and the transformer had become practical devices that electricity became something more than a laboratory curiosity.

The generator, the motor, and the transformer

<sup>1</sup>United States Census, 1880, Vol. 16.

<sup>2</sup>Municipal Journal, March 1, 1917, pgs. 301-303.

make it possible, in effect, to move the rivers that are in the mountains or in the forests far from the centers of population to markets where the power may be used. Demand for electric power is concentrated in the cities and it has been the task of the electrical engineer to supply electric power to those who want it. Engineers and the public utility companies have satisfied the demand by constructing steam generating plants in the cities or by transmitting energy from hydro-electric plants or steam plants located at a distance from the market. A number of hydro-electric plants, together with several steam-plants, may be necessary to supply the power used by a single large city. Power lines may be used to bring this power to market in much the same way that roads aid those who are engaged in bringing produce and other raw materials to market. Electric transmission also provides a means for breaking up the power generated in a large steam plant or at a large water-fall and of sending it to a number of industrial establishments or even to a number of cities or communities.

In addition to the advantages of electric transmission as a means by which power may be brought from an outside source to an industrial establishment, <sup>electricity</sup> ↑ may also be used to advantage as a means for distributing the power to the various machine units in a plant. Belts and shaft-

ing are much less efficient agencies for distributing power than is a well designed system of individual motor-driven machines. An increased consumption of electricity generated by the utility companies has grown out of the greater use of individual motor drive. Water-power development has also been stimulated by the broadening of the market for power.

Enterprisers, stimulated by the moderate success of hydro-electric projects, have felt a revival of interest in water-power and the rivers. Some of the first fruits of this interest were the attempts made to determine the amount of water-power available for use.

### POWER SURVEYS .

There has been much speculation regarding the extent of the power resources embodied in the rivers within the United States. Many surveys and estimates were made as a natural result of this interest.

The first Federal survey was completed in 1880. An entire volume of the census of 1880 is devoted to an enumeration and discussion of the water-power development up to that time. It was limited to the Eastern portion of the United States and consists of an history of a number of projects in New England and in other regions in the East, together with an enumeration of the unused power

sites available for development.

Private individuals have made surveys and estimates since 1880, but the very reliable government estimates have now entirely superceded them. Private surveys are of little consequence now.

Reliable data were not available upon which to base an estimate of the power resources of the country until the beginning of the twentieth century. Information had been accumulating in the files of the various government departments but was not compiled into one report until 1908. It was at President Roosevelt's request that all available knowledge of water-power resources was collected and compiled for the purpose of estimating the power resources. Such care was used, when this last estimate was made, that it is still considered trustworthy.

#### POWER RESOURCES AND REQUIREMENTS IN THE UNITED STATES

According to the estimate of 1908, the rivers within the United States can be made to carry a load of 28,000,000 horse-power at all times and 54,000,000 horse-power six months out of the twelve.<sup>1</sup> Both of the foregoing amounts are probably too small rather than too large, yet they convey a very accurate notion of the maximum

<sup>1</sup>World Atlas of Commercial Geology, Part II, pg. 14.

amount of power that American rivers can be made to deliver. Rivers cannot be compelled to carry any load that may be imposed upon them. Their capacity is limited.

The available water-power is but a bagatelle in comparison with present power installations in the United States. Factories in the United States have installed steam plants with a total capacity of 25,504,792 horse-power,<sup>1</sup> central-stations have approximately 20,000,000 horse-power capacity,<sup>2</sup> steam locomotives add 65,000,000 horse-power more to the total,<sup>3</sup> but it remains for the seventeen or more million automobiles to furnish the major portion of the total amount, with a combined power capacity somewhat in excess of 300,000,000 horse-power.

Installed devices are capable of generating a vastly larger amount of power than is actually used or needed. Many prime movers are idle at any given time and many more, although not idle, are being loaded below capacity. Even though the actual constant power output is probably not over one-tenth of the installed capacity, there is still a possibility that there is not enough water-power to carry a burden equal to that actually carried at

<sup>1</sup>Abstract United States Census, 1920, pg. 1035.

<sup>2</sup>Baum, F. G., Atlas of the U.S.A. Electric Power Industry, pg. 6.

<sup>3</sup>Ibid, pg. 6.

present, if it ever becomes necessary for it to do so.

By far the larger part of the water-power resources of the United States are now unused for the very good reason that industries have been developed to depend upon coal and most of the water-power resources of the United States happen to be located far from the market. Changes must be made in electrical practices, and the distribution of industry, if water-power is to be fully utilized. An attempt has been made to fit water-power into the scheme of things in a more harmonious manner. Private parties and the Federal Government have both been interested in systems for making more water-power available. Private and public planning of water-power systems has recently taken on an entirely new aspect and will doubtless be responsible for a change in the attitude of the public towards power development.



## CHAPTER II

### ECONOMIC ASPECTS OF POWER DEVELOPMENT

#### SUPERPOWER PLANS

The first so-called superpower plan was drawn up by the Federal Government in 1921.<sup>1</sup> It was based upon the assumption that many of the operating practices of the great power companies of certain districts may well be used by smaller companies and in other regions. Most of the first superpower report consisted of an enumeration of the advantages of electrified industry and transportation with specific reference to the Boston-Washington area. A bold plan of electrical development and transmission was outlined with the idea that it would be more of a suggestion to those who are developing the industry than a detailed guide to be followed when installing plants.

Suggestions were secured from the giant power systems which have been developing in the South Atlantic States and along the Pacific Coast. Large companies have developed systems in both regions which may be called superpower systems, without exaggeration, since they cover a wide area and serve a very large number of customers.

<sup>1</sup>U.S. Geological Survey, Professional Paper, No. 123.

Conditions in California and the South Atlantic States have favored the building up of large systems and have been responsible for a part of the success of interconnection and other practices, but some officials of the Federal Government seem to have had the notion that a survey would disclose the fact that it is advisable to extend certain practices to other sections of the country.

Since the results of the first study were published, a committee has been appointed for the purpose of considering the power needs and possibilities of the Northeastern States. This committee is called the Northeast Super Power Committee. It has already issued a report,<sup>1</sup> which echoes the conclusions of the earlier study made in 1921.

Newspapers have taken up the work of popularizing the superpower type of power development. Several of the more enterprising newspapers have drawn up plans for the development of the power resources of the entire United States. Such organizations have not had the hundreds of thousands of dollars it is necessary to spend in order to make a respectable survey of any one district, much less

<sup>1</sup>Report of the Northeast Super Power Committee, 1924. A study of the power needs and resources of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Maryland, and the District of Columbia. Ohio, Virginia, and West Virginia were also partially surveyed.

for the entire country. Hence, their plans have been superficially considered and, consequently, have been vague and unscientific.

The Chicago Tribune published a power plan August 5, 1923, which consists of a badly drawn map and several columns of text containing a few plausible statements set forth in a popular style. Like all the others of similar character it is absolutely worthless, except for purposes of publicity.

Other more or less ambitious studies have been made by organizations and individuals during the various stages of popular feeling which superpower has engendered. Stress has been laid upon the saving of coal which would be effected, the increased output which would come from the industrial establishments, and the general improvements in well-being which would result in case certain gigantic electrical schemes were carried out; but little else of a constructive nature has been accomplished.

Superpower has been represented to the American people as being a sort of amiable giant that will be able and willing to assume the major burdens of industrial activity once it is instituted. As a result of widespread publicity campaigns, many think superpower will bring the six hour day with it. Others see visions of a new and better social order, free from the scourge of poverty.

Many consider superpower as something for the future instead of as an evolving system. Thus, false notions have been fostered. Some service, however, has been rendered by this publicity because the public interest has been centered, for a time, on the questions of electrical generation and policy.

Accounts of the millions of tons of coal needlessly consumed because industries are organized and equipped as at present have stimulated the conservation movement. The public has begun to think more tolerantly about monopoly and business. It has been shown that many of the problems which, when viewed superficially, appear to be local ones are national, instead. As the public has grasped the difference between local and national matters it has become less hostile to public service companies and more inclined to look with favor on national regulation of utility companies. Publicity given to power plans and practices has helped smooth the way for the financing of improvements and extensions in the power systems. The public buys the bonds and stocks of the electric generating and distributive systems and while, theoretically, the securities are purchased only after cold, calculating analyses have been made, yet a friendly feeling towards the utility companies seems to help financing.

Any policy is to be recommended which will give the public an opportunity to know what is being done and why.

ADVANTAGES OF ELECTRIFICATION OF INDUSTRY  
AND TRANSPORTATION

Engineers are not awed by superpower and with good reason, because they made it. They have merely applied the principles of specialization to the power industry and superpower is the product. Results have demonstrated that electricity may be produced, and usually is produced, under conditions of decreasing costs. Advantages of electrified industry accrue chiefly because of the lower losses in electrical power distribution, as compared with mechanical, and the greater labor output made possible by its convenience.

Industries are not the only users of power which are able to secure advantages by electrification, as many first-hand economies accrue to the railroads when they change to an electrified system. More freight may be handled without increasing the number of tracks. Larger trains may be hauled at a higher rate of speed with a corresponding decrease in expense for equipment and crews. Maintenance costs on electrical equipment are less than on steam equipment of equal capacity. Finally, power may be generated more cheaply in a central station than in a

steam locomotive.

As economy warrants the changes and available capital makes them possible, indirect machine drives will be replaced by direct, railroads will be electrified, and the use of electricity will be extended into other fields where it is not used at present. A larger and larger portion of electric current will be generated in central stations as manufacturers and consumers of large amounts of power become convinced that central-station power is cheaper and as reliable as power generated in their own power houses. An increased use of central-station power will bring the superpower plan into operation and will enable both central stations and other industries to make use of its technological advantages.

If independent companies are to generate electricity and sell it to manufacturers who are, in most instances, able to generate their own power, the generating costs of these central stations must be very low and public regulatory bodies must be willing for them to charge a very much lower rate for electricity used for power in order to make their product attractive.

It has been found that the economies of a large, well-located and constructed central station may offset the losses in a relatively long transmission line. Superpower plans stress the economies of transmission of power

by means of electricity and advocates the location of large steam-plants at the mines, if sufficient condenser water is available, or at the seaboard where coal may be shipped in by water. When superpower is established transmission lines will radiate from each power center to supply the surrounding industrial district and to connect up with the transmission lines from other power centers.

Cities are favoring centralized power generation because it will remove the present smoke nuisance caused by factory boilers and leave only the domestic coal consumer to contend with.

#### SUPERPOWER PLANS FAVOR WATER-POWER

The Federal superpower plans provide for the development of all the economical water-power sites in the various districts. Water-power is expected to carry as large a part of the burden as possible. Both steam and hydro-electric plants will pour power into a common transmission system from which the consumers will be supplied. Interconnection of steam and water plants is essential to a complete and satisfactory electrification of industry and transportation in zones where much power is used.

There are now three districts in the United States where interconnection has been carried far and it happens that they are also the regions where a large amount of water-

power is used. The power systems of these three regions form the nuclei around which a national superpower system will ultimately develop.

THE PRESENT EXTENT OF SUPERPOWER DEVELOPMENT  
IN THE UNITED STATES

Seven large companies, with an output of over two billion kilowatt hours per year, are interconnected into a system which furnishes power to the industries and domestic consumers in the states along the South Atlantic seaboard. Power is supplied by the Alabama Power Company, the Columbus Power Company, the Georgia Railroad and Power Company, the Tennessee Power Company, the Southern Power Company, the Carolina Power Company, and the Georgia-Carolina Power Company.<sup>1</sup> Some of the advantages of such an arrangement were pointed out by Thorndike Saville in a bulletin published by the North Carolina Geological and Economic Survey in 1923:

"The ability to interchange power among the various Southern Appalachian States is one of the principal factors affecting the low rates for electrical energy obtaining in these States, and in turn this attracts industrial development. A striking instance of such inter-

<sup>1</sup>Magazine of Wall Street, Vol. 34, No. 5, pg. 364.



change was afforded in the fall of 1921 and 1922 when the Carolina Power and Light Company's plants suffered diminished output from severe drought. An arrangement was effected whereby the steam-plant of the United States Government at Sheffield, Alabama, was leased for the use of power companies in the southeastern zone. The output of this plant being used in Alabama made possible transmission of an equivalent amount of energy to Georgia where it was used. The same amount of energy from Georgia plants was sent into the Southern Power Company's system in North Carolina, from which an equivalent amount was finally transmitted to the Carolina Power and Light Company. The total distance over which this interchange took place was nearly 1100 miles. No interchange of power on such a large scale over such a distance is possible anywhere else east of the Rocky Mountains."<sup>1</sup>

A second area comprises that district within a radius of two hundred miles of Chicago. Generating plants in the Chicago zone are not as completely interconnected as they are in the first one mentioned, but there is enough interconnection so that the electric industry may be considered as well on the way to a complete superpower sys-

<sup>1</sup>Saville, Thorndike, The Water Power Situation In North Carolina, North Carolina Geological and Economic Survey, Circular No. 6, 1923.

tem.<sup>1</sup> Steam is used to generate most of the power used in and near Chicago which, has been one of the causes retarding interconnection, but the heavy industrial demand and the large number of generating stations has made interconnection both inexpensive and desirable.

Companies operating in the Pacific Coast States have developed the greatest interconnected system in the United States. Within the three Pacific Coast States, California, Oregon, and Washington, are thousands of miles of transmission lines which pick up power generated by many stations and spread it out over the territory in a very efficient manner. The Southern California Edison Company, the Pacific Gas and Electric Company, and several others are tied into a practically complete system. By the time this report is completed, the few remaining gaps may be bridged. Even if they are not, either of the two companies mentioned has enough transmission line mileage to be called a superpower system. There is no need for either company to share the honor of that name with any other.

The two districts most nearly interconnected have a characteristic in common. Water-power carries a relatively large part of the burden in each of them. This is to be expected, since inter-connection effects greater

<sup>1</sup>Magazine of Wall Street, Vol. 34, No. 5, pg. 364.

economies in hydro-electric systems than in steam-generating systems, although it has a very beneficial effect upon the character of the service each renders.

### WATER-POWER VERSUS STEAM-POWER

Water is inferior to steam as a source of power. It is not as reliable because there is usually a great deal of variation in the flow of the streams unless storage is resorted to. During the dry seasons of the year the flow may fall off to such an extent that not all the demands of the consumers can be met without the use of auxiliary power from a steam-plant. Operation of hydro-electric plants is disturbed by high-water and may even be suspended at such times. The generating stations are usually situated at some distance from the market, with the result that the transmission lines are another vulnerable spot which may cause interruptions in the service. Sleet and wind are especially to be dreaded if the company is striving to maintain satisfactory service.

Customers are not always appreciative of efforts made to keep up the quality of service. They are not concerned as long as service is good, but are often troublesome when it fails. When the customer wants light he wants it at once or not at all, so he says. Factory owners are impatient when the plants must be shut down for lack of

power because they lose money when their plants are idle. They have reason to complain when service is bad.

Hydro-electric companies must furnish power, which is as reliable as the power which may be secured from steam-plants or else they must charge a rate sufficiently low to compensate for the difference in the two forms of service.

In order to render good service, the large power companies have found it desirable to maintain stand-by steam-plants so that they may furnish power when the hydro-electric plant is unequal to the task. Stand-by plants are used to furnish the extra power necessary to carry the peak load of the day, during seasons when the water is low, and at other times when the water-wheels cannot carry the load. The amount of auxiliary power needed is determined by the circumstances; hence it varies widely. In some cases, as at Niagara Falls, there is need for but little steam stand-by equipment, while in other cases the auxiliary installations are as much as eighty per cent of the installed water-power in the system.

Extra or auxiliary equipment increases the investment with corresponding higher overhead costs and operating expenses, which must be paid for by higher rates.

#### ADVANTAGES OF INTERCONNECTION

Interconnection is a partial solution for several power problems. Interruptions due to the failure of transmission lines may often be avoided, unless there has been extensive damage, by relaying power around the break, much as telegraphic communication is effected at such times.

Less stand-by equipment is needed when several water-power projects, located on different watersheds, are tied together, than would be necessary were they operated as separate plants. The periods of maximum or minimum flow of two or more nearby rivers may not coincide; thus there may be a higher average flow than would be true of unrelated plants. A dry season on one watershed may be accompanied by rains on another, or periods of heaviest rainfall may vary for the different rivers supplying power to the system. The larger the territory covered by an interconnected system, the more likely that the conditions of variable flow will counterbalance each other. In addition to the offsetting of water flow, another advantage accrues because it is usually possible to secure a better distribution of power demands throughout the day and the year if the territory served is large enough to contain rather diverse industries.

A power plant is most profitable if it can be operated to full capacity at all times. Capacity operation is an ideal condition which managers are constantly striv-

ing to bring about. Plants furnishing power for residential lighting, and for no other purpose, are called upon to furnish a large amount of current during certain hours of the day or night, while the rest of the time they do practically nothing. During off hours the machinery is shut down or is run with little or no load. Costs go on at about the same rate regardless of whether the plants are running or not. The overhead costs of water-power projects are especially relentless. Managers of hydro-electric plants have found that interconnection is a means whereby more customers can be reached and a more diversified power load built up.

Electricity cannot be stored, but must be generated as demanded. Each plant or system of plants must have sufficient installed capacity to take care of the peak loads. It is to the advantage of every power company to sell power to the full capacity of its plant, even though during off peak periods the current is sold at a very low rate. The distribution of power peaks in an interconnected system enables it to take care of a larger average load with a given amount of machinery than small independent plants could carry.

Interconnection brings about economies, but to interconnect is not such a simple matter as the previous discussion may have led the reader to believe. On the part

of the companies it involves questions of engineering technique, together with the necessity for a nice weighing of expense and advantage. The practice of power exchange must almost certainly result in combinations and consolidations of power companies and interests with a trail of complex corporation relationships and reports of investigation committees in its wake. Questions of governmental policy will then be more complex than they would be otherwise.

Many people have been impatient because of the slow rate at which interconnection and the other basic practices of superpower have spread. They have counted the advantages. They have considered the technical difficulties and think they are unimportant. Many have condemned the business enterpriser because the public utility companies and water-power development have not advanced as rapidly as might be desired. Conservationists have not always given enough weight to the cost of enterprises and their ability to yield an income, but have considered the total income as a net saving, which is not correct.

### CHAPTER III

#### THE ECONOMIC ASPECTS OF WATER-POWER DEVELOPMENT

It has been the policy of the national and the state governments to place the responsibility for the initiation of water-power development into the hands of private enterprisers and to content themselves with the regulation of the resulting activities. Such a policy is essentially negative, but then, most governmental policies must be negative, when the private individual is depended upon to make extensions and improvements in industry. Since business motives and practices play such an important part in water-power development, a thorough understanding of the problems of conservation and business practice must be based upon a knowledge of the individual point of view. It is necessary to consider the motives that impel business men to enter the water-power field; the deterrents that make enterprisers delay; and the practical problems that must be solved, in any case, before conclusions may be drawn regarding the present status of, and the future prospects for, the industry.

Every water-power prospect is judged by the enterpriser in the light of what he knows about, or thinks of, its prospects as a profitable investment. He considers it as a separate unit and not as a part of a power



system. If the enterpriser considers a prospect attractive; if he can finance the construction; and, if he can secure permission for the development, then the plant is constructed; but in <sup>case</sup> any of the links in this chain are weak, the project is not developed.

The first of the three factors, namely, financial attractiveness, is by far the most important. Over long periods of time, enterprisers will compare the costs of different sources of power and they can be depended upon to use those which are the cheapest in practice. Water-power and steam compete on a cost basis, as well as on a service basis, and more frequently than is generally supposed water-power is second best. In regions where coal is cheap the best water-powers will be the only ones used, if enterprisers have their way. Business is seeking profits, rather than some vague objective, and in those cases where society benefits from the actions incident to profit seeking, the benefits are usually incidental to the securing of profits. Necessity demands that business men be practical; hence, we may conclude that the prevalent type of development is, currently at least, the most profitable.

Whether enterprisers consume the power they generate or are engaged in the business of selling it to others, they are most concerned with the average cost of power actually consumed or delivered. Enterprisers are only

mildly interested in what might be done under different circumstances, except in so far as more ideal conditions may be effected without undue effort or expense. A given water-power project may be more economical than a steam-plant, under some conditions of loading, whereas a different load factor might reverse this condition. A water-power project might be constructed in anticipation of a more favorable load factor, but it would not be more profitable than steam, until the necessary change came about. From the business standpoint it is unwise to use water-power at all, when the conditions are unfavorable, unless the conditions can be changed cheaply.

Development of any particular project is not undertaken, as a rule, until many factors have been taken into account. The enterpriser must be satisfied that he can secure title to the property or a satisfactory equity in it, otherwise he will not invest his funds.

Projects must be the right size. Some are too small to pay; others are too large. Small water-power projects are seldom profitable, because it requires almost as much labor to operate a small plant as it does to run a large one. Automatic and semi-automatic hydro-electric plants are now overcoming the labor handicap of the small plant; but creeks are still shunned by all save small operators.

In case the market is unable to absorb a large portion of the power which may be generated at a project, it is necessary to partially develop it or not use it at all.

Unless there is a good prospect that the market will soon be able to absorb the total power output, at least a part of the time, the usual procedure is to wait. Most of the expenses of complete development must be made whether all the power is used or not. The power house, the dam, and the transmission lines must be constructed and the major portion of the generating equipment is usually installed, even though much of it is not to be run steadily. About the same amount of labor is needed in either case; hence large projects are seldom used until the major proportion of their power can be disposed of to advantage as soon as they are completed.

A project may be of satisfactory size without being developed if difficulties of constructing the works are such that costs are likely to be excessive. Engineers are able to make very close estimates of developmental costs and no responsible company is likely to undertake the construction of works without first having such estimates drawn up. Whenever the project is far removed from the market the transmission costs may prove to be so heavy that they will preclude profitable operation.

Transmission cost may be divided into three parts.

Maintenance and depreciation make up a large portion of the total. Interest charges on the capital invested comprise the second major item, while the third is determined by the energy loss occasioned by sending current through the line. These costs are somewhat interdependent and each can be reduced at the expense of the others, but in few cases is it possible to reduce the total by juggling. It is possible to reduce the line loss by constructing a more efficient line, but such a line is more costly to construct than a less efficient one would be. Such a line would increase interest charges, which increase might more than offset the savings due to its electrical efficiency. Electricity can be transmitted long distances with but small line losses, but that is a different thing from transmitting it long distances at low cost. The farther the generating station is removed from the consumer, the greater is the portion of the cost of the current that is chargeable to transmission. Market conditions must be very favorable and the projects must be good ones if the current is to be sent a long distance to the market. A long transmission line is invariably costly; and when constructed to carry current at a predetermined loss, the cost of construction varies roughly with the square of

the length of the line.<sup>1</sup> Long transmission lines often cost as much or more than the primary plants from which they carry power; thus the distance from market has a great deal to do with the development of individual projects.

Cost incident to the distributive system must be taken into consideration when computing the cost of power, but is not of much importance in case the enterpriser is weighing the question of water-power versus steam, since either would require practically the same amount of local works.

Investment in the works and the costs of operating it determine the rate at which the current can be delivered to the switchboard of the power house. Power-house costs are increased by the expenses of operating the transmission system. Finally, distribution costs must be added to the other two in order to determine the cost at the customer's meter.

In 1922 the California Railroad Commission made a study of the problem of power costs. Investigation disclosed that the average cost of power at the hydro-electric station was 4.25 mills per kilowatt hour. Expenses of the stand-by steam-plants raised this to 6.28 mills. Other costs brought the figure up to 1 cent at the substations.

<sup>1</sup>Mr. Valvert Townley before the National Waterways Commission, 1911. Senate Document No. 274, 62nd 2nd session, pg. 56.

The California commission found that power distributed to power users costs 2 cents on the average, while that used by the domestic consumer totaled 7.4 cents. These were average costs for California during 1921.<sup>1</sup>

Such a tremendous increase in costs after the power has been generated is indicative of the effect that distance from market has on the development of the power resources of a region. Advocates of long distance transmission might well consider transmission expenses before advocating radical changes in methods.

#### COST OF HYDRO-ELECTRIC VERSUS STEAM-PLANTS

Hydro-electric plants are generally more costly than steam plants of the same capacity. In some cases developed projects have cost three, four, or more times what a steam plant would have cost. Heavy initial expenditures, with the interest charges they entail, balance in a large measure the somewhat larger outlay for labor and the expense of coal used by a steam-plant. Hydro-electric stations seldom have an operating ratio above thirty or thirty-five per cent, whereas the operating ratios of steam-plants are much higher; but the heavier interest load hydro-electric companies must carry reduces their net

<sup>1</sup>Merrill, O. C., Fallacies Concerning Power Development, Power, Vol. 68, No. 8, pg. 311, Aug. 2, 1923.

earnings to a point where they approximate those from steam-plants.

Relentless and heavy fixed charges make it very desirable that the load factor be as high as possible. Steam-plants cannot be shut down for any length of time, since fixed charges go on there too, but the burden of the hydro-electric company is generally heavier. Interest burden, as much as anything else, has been responsible for interconnection in the regions that depend upon water to generate their electrical power.

Finally, the advantages that hydro-electric stations may have, in other ways, is lessened whenever it is necessary to construct auxiliary plants. Stand-by plants must be kept in repair throughout the year. They must be in readiness to take on a part of the power burden on short notice. Steam must be kept up in at least a part of the boilers and a working force must be on hand at all times to meet emergencies. Stand-by equipment increases the cost of power at a rapid rate as the relative amount of it goes up. It costs little more to run a steam-plant than to let it lie idle, and power users must pay the cost in either case.

### STEAM COMPETITION

Improvements are constantly being made in steam

engineering practice with correspondingly lower costs. Every important improvement tends to check the extension of hydro-electric development in those sections where coal is already the mainstay of industry. The rapidity with which changes have been made may be judged by the fact that the average coal consumption per kilowatt hour dropped from 3.4 pounds in 1919 to 2.3 in 1923.<sup>1</sup> Some of the more efficient central stations are now generating electric current with a coal consumption of less than 1.9 pounds per kilowatt hour. The mercury boiler is now being tried and may soon be in more general use, since it is able to effect marked savings in coal consumption. There is no apparent end to this line of betterments.

Enterprisers must be convinced that, everything considered, the water-power projects is a more desirable one than a steam installation would be, before the water-power project is built. No government can force capital into this field as long as free enterprise is maintained, and other forms of investment are available for capital. Capital cannot be coerced. Those who would see water-power used, at the expense of coal consumption, must be willing to pay the price, in a differential rate granted hydro-electric companies, by a direct subsidy, or by a

<sup>1</sup>Breedlove, S. B., Electric Utility Financing, Banker's Magazine, September, 1924, Vol. CIX, No. 3, pg. 367.



tax upon coal.

As a matter of policy it would probably be more desirable for the government to forestall the undue extension of development of water-power, by those ill advised, than to encourage or even permit unfit persons or companies to enter the field. Successful development of a project requires ability of a high order and unless such projects are well managed after they are constructed, failure is very likely to result. Failures in the hydro-electric industry should be held to a minimum in order that such projects may be easily financed.

Some have argued that the development and operation of water-power should be a public function, but if the Federal Government did own and operate hydro-electric projects, it could not disregard the things which influence the private interests now so engaged without resort to taxation to make up the deficits. The social loss resulting from an unwise development would be no less under public than it would be under private control, and would be equally undesirable. It is likely that the number of such unwise ventures would be greater than now, if we are to believe the critics of governmentally controlled and operated enterprise.

In case business motives were entirely disregarded, it would be possible to develop the major portion

of the water-power in the United States in the next few years, even though such a policy would involve the expenditure of billions of dollars. Many of the plants so constructed could not be made to pay any interest on the investment and a large part would return less than the current market rate. Instead of such a policy resulting in a net social gain, the saving of coal would be neutralized somewhat by the losses in unproductive investments. Such a policy might be positively wasteful, rather than conservative. When joint projects are constructed to prevent flood damage, reclaim lands by irrigation, or to clear the rivers for navigation, a part of the cost may properly be borne by the government, but it is doubtful if this would be true in case power were the only product. Those who insist that the government is the best agency for making hydro-electric developments base their arguments on the premise that the aims of the government are different and may be more costly, but are worth the difference in price. A quotation will illustrate the point:

"A lumberman may cut down a forest at a minimum expense per tree without satisfying those who know that the forest should not have been cut down at all, that floods and erosion will do harm greatly outweighing

the lumberman's profit on his operation."<sup>1</sup>

<sup>1</sup>The New Republic, Jan. 21, 1926, pg. 217.

## CHAPTER IV

### PUBLIC REGULATION OF HYDRO ELECTRIC PROJECTS

It has been recognized for many years that some forms of private activity are closely bound up with the public interest. Special activities have come to be considered as functions that the government has seen fit to delegate to private parties in the course of promoting the public welfare.<sup>1</sup> The monopolistic character of public service undertakings, together with the legal theories regarding them, has resulted in the building up of a distinct set of rules affecting the rights of private property in the public utility field.

Legal definitions are especially vague when applied to public utilities. They merely state that public utilities are those bound up with the public interest. The courts have been called upon from time to time to apply this rule to particular activities. Their decisions have gradually enlarged both the field and the rule. Private rights have been constantly championed by persons who are ever on the alert to defend them from those who would curb private activity in the field thus set apart. Changes have been made despite their efforts. One by one

<sup>1</sup>Hartman, Harleigh H., Fair Value, pg. 25.

the rights enjoyed by corporations and individuals engaged in competitive business have been taken away from the public utilities. The right of eminent domain, which some of these companies enjoy, is scant recompense for losses they have suffered, especially where the companies have been subjected to political attacks. In some cases they have lost much of their power of initiative and the right to manage their own affairs according to the business judgment of their managers. On the other hand there are gains to balance these losses. Regulatory bodies are gradually becoming convinced that monopoly is best and that it is a good policy to protect the companies from those who would despoil them. This eleventh-hour change of heart has resulted in a more tolerant attitude towards the utility companies and a disposition to counteract and forestall unwise legislation.

#### MUNICIPAL REGULATION

City governments were the first to attempt to regulate utility companies. In practically all cases the problems were local and more or less unique. The companies were attacked at first with all the zeal of a crusade, but later corruption entered into the activities of regulatory committees. Despite the mercenary attitude of many city officials, much good has been accomplished by local

regulation. Examples might be given to show how corrupt the regulation of utilities was under the local system, but examples would not show the reason for the rather general breakdown of city regulation. Local autonomy gave way to state, in part, because the problem had outgrown the cities. The development of telephone companies, electric power companies, and others that serve a wide area, enabled them to escape, in a measure, by the use of political jockeying and the playing of one city against another. Systems which should have been considered as a unit were subjected to regulation by more than one municipality. The relations between such companies and the cities they served ranged from that of amity to open hostility. The companies were annoyed by the tactics used and, as a rule, were in local politics with a vengeance so as to secure favors on the one hand or warning of impending measures on the other. Strong companies were frequently able to forestall regulation, while the weak ones were further crippled. By 1907 the situation was such that in many places the cities were unable to cope with the large business interests. Many of the utility companies had become too large for one city or even several to control.

#### STATE REGULATION

In 1907 Governor Hughes succeeded in establishing two state commissions to regulate the utility companies in the State of New York. Two commissions were organized for the purpose of improving the regulation of public utility companies by securing a measure of control over them, in the first instance, and by establishing uniformity of treatment, in the second. It was thought that the state could secure better commissioners than the officials that had been used by the cities and that there would be less partisan feeling with which to contend if the state regulated the utility companies.

In the same year the State of Wisconsin extended the power of its Railroad Commission so that it might regulate telephone and telegraph companies. New York and Wisconsin were the pioneers in a movement which was to spread rapidly throughout the country. State commissions proved to be so much superior to local bodies, when handling large companies, that acceptance of the new plan was both rapid and general. Commissions were created at such a rapid rate that by 1913 all but two of the states<sup>1</sup> had followed the lead of New York and Wisconsin.

POWERS OF STATE COMMISSIONS -- LACK OF UNIFORMITY

<sup>1</sup>Iowa, Texas.

In practically no case is it intended that state bodies should constitute the sole means of control, but that they should lend dignity and effectiveness to regulation as a governmental function. Most of the local bodies still retain the power to settle many local matters without state interference. The services of state commissions have been most effective where fractional jurisdiction under the old methods resulted either in a lack of uniformity of regulation or inability to regulate at all.

The commissions set up by the various states differ widely among themselves. In some cases the members stand for election, while in others they are appointed to office. Opinion favors the appointive system as the one more likely to secure competent officials, since the type of man that is willing to campaign for public offices, which do not pay well, is not likely to be as high as would be secured by a chief executive. Undoubtedly the duties are more arduous in the more populous states; but where the commissions are expected to devote all their time to this one job the remuneration is for time rather than for effort. Fifteen hundred dollars per year to fifteen thousand dollars per year is perhaps too great a spread in salaries. Those states which pay small salaries must be content with mediocre service. There is need for greater uniformity of compensation, although complete



uniformity is not essential since there is a great variation in the amount of work that the commissions are expected to do. Each state must balance salary and efficiency requirements in the light of its own experience.

In theory the state public service commissions consist of a group of experts charged with the task of administering the laws governing public utilities. They have little or no power to interpret the law, but administer it. Interpretation of the laws is left to the courts. Such a system relieves the courts of much detail work without depriving them of the right to guard the interests of the people. They are still the guardians of life and property. The legislatures pass the laws. The commissions administer them.

The variations in the state laws have divided state public service commissions into two groups. One class consists of bodies which may be called boards of review. Their powers are passive. Commissions of this type cannot begin investigations or propose new rates, schedules, or operating practices, but must content themselves by hearing the cases brought before them by the utility companies, consumers, or by some public official not connected with the commissions. Commissions of the other type have more or less power to start the processes out of which rulings emerge. The latter type is better able to keep the

companies abreast of the times and is more nearly in line with the powers that an enlightened public opinion is in sympathy with.

One of the most serious obstacles to the extension of utility services across the boundaries of states is lack of uniformity in the laws and in the practices of commissions. There is little uniformity of practice even where there is legal uniformity. Most of the states have provided that the utility companies shall keep an approved set of accounts; yet in the electric power field the American Electric Light Association has been more instrumental than the state bodies in securing the adoption of uniformity in accounts. A system of accounts is essential in any plan for valuing properties for rate making; yet the commissions of the various states permit the companies to submit information that is not comparable with that secured in other states. Information secured from these reports is used as the basis to which different valuation theories are applied in an attempt to arrive at just rate decisions. It is only because of the decisions of the Supreme Court that valuation theories have been kept within reasonable limits. Accounting regulations have been imposed in many states without much regard to what other states had done or were doing along the same lines. Some fruit has been borne as a result of the efforts of the National Electric

Light Association, but the motives of such a trade association may frequently be questioned whenever it deals with valuation and rate-base accounting theories.

The annual conventions of public utility commissioners is another force making for uniformity and standardization of practices. Much has been accomplished at annual meetings, but it will take many years for their influence to make material changes in practices. In the meantime problems will arise that must be solved and quickly, if certain lines of electrical development are to continue. A reasonable degree of uniformity is becoming more and more necessary if development of water-power and inter-state electric transmission is to proceed at a rate determined by economic needs. It is probable that the need for uniformity will result in a new relationship between public utilities and the government. There is evidence that the solution will involve a much greater use of the regulatory powers of the Federal Government and a decrease in the importance of state regulation.

#### FEDERAL REGULATION

State regulation has made many warm friends, despite its faults. It has been generally accepted as a working principle which should be given a thorough trial. State regulation has failed utterly in some instances and

has not been entirely satisfactory in others, but there is no prospect that it will soon be abandoned. When the Federal Government definitely enters the field of public utility regulation, it will probably supplement rather than supplant regulation by the states. The recent increase of Federal activity has not resulted in any material encroachment upon the preserves of the state, except where theoretical rights and powers are considered, for it has done only those things that the states have not done or would not do. There are phases of the power question that require the steady hand of the Federal Government and its increasing activity is evidence that it is not evading responsibility. Federal activity, as far as the utilities are concerned, is now most pronounced in the water-power field, yet the fact cannot long remain concealed that the stopping point is not with water-power, but that ultimately Federal regulation must include all utilities doing an interstate business.

The shifting of the seat of control is not evidence of a change in the policy towards the public utility companies. The theory that private ownership is best, but must be watched, is not altered by the increasing activity of the Federal Government. Scarcely anything stands out as evidence that there is any drift towards government ownership.

While the Federal and state governments maintain this godfather relationship to the public utilities, they are not called upon to finance the developments nor are the public officials responsible for details of management. Yet many of the advantages of public ownership have been secured, and more may be, as public regulation is worked out to its logical conclusions.

#### PRESENT STATUS OF WATER-POWER REGULATION

Not all water-power developments are classified as public utilities. Only those companies which are generating electricity for sale come under the jurisdiction of the public utility commissions. Non-utility water-powers are declining relatively; yet the total power thus generated, and out of the hands of the states, is considerable. The non-utility plants will be supervised by the states as soon as state water-power policies are developed. They will be regulated in much the same way by the states as they would be by the Federal Government were they under the authority of the Water-Power Act of 1920.

Water-powers which have come under the state commissions have been hydro-electric projects, almost without exception. Some of them have been used for the generation of electricity, sometimes in connection with steam-plants, but about as often as not in competition with steam-plants.

Active or potential steam competition exists in most places where hydro-electric generating plants are used; hence state commissions have followed the practice used in the general utility field. There was no separate and recognized water-power policy, as far as the states were concerned, until the Federal Government took the lead. Several states now pretend to have water-power policies,<sup>1</sup> yet the statements of the policies clearly show their indebtedness to the Federal <sup>Water Power</sup> Act of 1920. The lack of a water-power policy in a state has not meant that hydro-electric companies have gone unregulated. They have been considered as a part of the general utility field and have been subjected to the same sort of restrictions as are imposed upon companies of their class. In general, this lack of differentiation has been a wise policy. New York is the only state which now provides a special water-power commission for regulating water-power development and operation.

State commissions have had a measure of control over the issuance of securities, rates charged for power, and the services rendered in exchange for the rates. The regulation of security issues has gone much further in

<sup>1</sup>New York has passed a Water-Power Act very similar to the Federal Act of 1920. Wisconsin has a fragment of an act passed for the purpose of fostering water-power development.

some cases than merely to regulate the amount of securities any company may issue. Proposed extensions and betterments have been carefully considered in order to ascertain whether or not they were advisable for the company and the public. The commissions have been especially solicitous in cases where rivers have been under development. The California Railroad Commission conducted an extensive investigation to determine the effect of certain hydro-electric projects upon salmon runs to spawning grounds. As a result, it specified that fish ways or ladders be installed; and it limited the dams to a height the salmon could scale.

#### UTILITIES OPPOSED TO FEDERAL REGULATION

The utility companies have opposed the efforts of the Federal Government to enter the field of regulation. They seem to consider state regulation as more desirable. The reason for their preference is not evident to the casual observer. Gifford Pinchot made the statement before the National Waterways Commission in 1911 that it was due to the fear that the Federal regulation would be more effective than the state regulation had been.<sup>1</sup> Bitter opposition does not seem to have had any effect upon the

<sup>1</sup>Pinchot, Gifford, Testimony before the National Waterways Commission, 1911, Senate Document 274, 62nd 2nd session, pg. 150.

steady progress being made by Federal regulation nor does it strengthen the cause of the states.

REGULATION SHOULD NOT BE PREDATORY

It is one thing for a group of investors to lose money in an ill-advised venture, but quite another for them to lose in a public utility as a result of unwise rate regulation. No government can expect private individuals engaged in the hydro-electric or any other business to continue to pour new capital into an enterprise unless the venture is a reasonably profitable one. It is to the interest of the public to grant a measure of protection to the capital invested in public utility companies. They need not be favored more than competitive business undertakings, but on the other hand they should not be singled out for attack by partisans. If persisted in, such a policy can only result in a breakdown of the persecuted companies. It is the lesser of two evils for the companies to earn too much rather than too little.<sup>1</sup> Profits in excess of a reasonable rate may be taken by rate readjustments, but losses are not as easily made up nor resulting bad service conditions quickly improved.

Bad service conditions have been due to a num-

<sup>1</sup>Pinchot: op. cit. pg. 150.



ber of causes. The two most important ones have been the stinting of the companies, due to inadequate financing, and the rapid strides made in the technological end of the business. Most companies have been unable to keep up with the demands for service that have been made upon them because of the lack of funds. In the second place, bad service conditions have been due, in part, to the fact that the best equipment available was not good enough to render satisfactory service. It is not likely that service was deliberately made bad. Unsatisfactory conditions have in many cases been due to factors not entirely under the control of the management of the utilities and the managers of these concerns have been chagrined because of their inability to improve the service.

Some of the dissatisfaction which has resulted from the regulatory system has been due to misuse of the powers vested in the states by their police function, while others are due to inherent defects that no simple remedies can cure. Trouble due to inherent defects has resulted in a continual modification of the details of regulation by those responsible for it; and agitation for its abandonment by those who think something else will be better.

Most noteworthy among the plans for curing the ills of public utility regulation and operation are those

that embrace some phase of public ownership. Plans for public ownership have for many years been interesting things to conjure with. Congress and others listen as attentively to the sage advice of those who would have the Federal Government operate Muscle Shoals as they would were the proposition novel instead of being moss covered and softened by old age.

The advantages and disadvantages of state ownership and operation as compared with regulation will be set forth in the next chapter.

## CHAPTER V

### GOVERNMENT OWNERSHIP

#### VERSUS

### PRIVATE OWNERSHIP AND REGULATION

Water-power was one of the first of the natural resources of America to be charged with a public interest. The builders of dams began to desecrate the rivers before the Federal Government recognized that water-power was worthy of being conserved. Most American rivers had long been dedicated to the memory of the steamboats that had once labored up and down their channels before their power possibilities were considered. Later, it was feared that power dams would spoil the fishing in some of the minor streams. Sportsmen showed more concern over the loss of a few trout streams in California than they did when the power companies invaded the spawning streams of the

**NOTE:** This chapter is based almost exclusively upon reports. So many references to these reports would be necessary that footnotes have been omitted from this chapter.

<sup>1</sup>Government Owned and Controlled compared with Privately Owned and Regulated Electric Utilities in the United States and Canada, by William S. Murray of Murray and Flood, National Electric Light Association, 1922.

<sup>2</sup>Re: "Murray Report on Electric Utilities Refutation of Unjust Statement, etc.", Hydro-Electric Power Commission of Ontario, 1922.

salmon. California sportsmen either lacked perspective and a sense of humor or they were canny politicians.

It soon became evident that water-power interests were likely to diminish the amount of land that the streams would irrigate, and would set a lower limit to desert reclamation than would be the case otherwise. Irrigation enthusiasts who had dreams of the desert blossoming <sup>like</sup> ~~as~~ a rose and flowing with milk and honey resented any such intrusion. Finally, it has come about that water-power possibilities are being considered as public property which should not be used for private gain.

A few see this so clearly that every scheme to keep the water resources free from the taint of unsocial monopolistic practices has been subjected to the most searching scrutiny before adoption and has been carefully watched afterwards, in order to make sure that expected results will be accomplished. Constant vigilance on the part of governmental officials and an intelligent minority of private citizens has been responsible for the consolidation of the governmental interests in water-power development and the passage of suitable laws to safeguard them.

In the process of controlling a monopoly it is but natural that sponsors of regulation look to some standard for their guidance and that they use some measure with

which to compare their results. There is no other way that a conclusion may be safely drawn regarding the effectiveness and desirability of regulative endeavor. The favorite standard for comparison has been government ownership and operation of industries similar in character to the ones being measured.

Theorists have argued pro and con regarding government ownership. Governments have experimented with it, in some cases with more than common success; yet the United States Government is not likely to enter this field on any large scale. It is equally unlikely that the fundamental relationship existing between the various governmental divisions in the United States and those engaged in developing the water-power resources of the nation will be radically changed in the near future. Although fundamental conditions are not likely to change, innovations undoubtedly will be introduced from time to time. New ideas and new practices are as likely to show up in governmentally owned and operated plants as in those run by private interests. New ideas have a habit of spreading, either to the operating companies or to the commissions responsible for their regulation. The Ontario Power System has been especially fruitful of new ideas and practices and, accordingly, has been a thorn in the side of the private companies in the United States and an inspiration

to those who have seen a vision of better things in the power field.

Consumers of power generated by companies operating in the United States have relied upon the efficacy of local, state, and national supervision and control, but the other countries of the world have not all followed such a system. In so far as the practices of the foreign governments lie in the field of interest for the reformers, and in the direction that changes in practice are likely to take in the United States, they may be and have been used as a measure with which to compare current with prospective conditions.

#### THE ONTARIO POWER SYSTEM

New Zealand has a state owned hydro-electric system which is operating satisfactorily and expanding with the needs of industry, but it has not aroused the interest of reformers as has the Ontario System. Lack of interest on our part in the New Zealand power system has been partly due to the lack of information regarding the New Zealand situation, the dissimilar operating conditions found in that country and in the United States, and lastly, their plan smacks more of the socialist than does the one used in Ontario. The last condition has restrained some who might have become enthusiastic otherwise.

Ontario's power system was put into operation in 1907. Since that time it has grown and prospered under the direction of Sir Adam Beck who is chairman of the Ontario Power Commission. Ontario has in this system a device whereby its cities are able to cooperate in the production and distribution of power on a scale which hydro-electric operations make necessary.

The act upon which Ontario's system is based authorizes the various municipal governments in the Province to enter into an agreement with the Ontario Power Commission for the purchase of electricity from a great centralized system. Power sold under these agreements was expected to be and is mainly produced by hydro-electric plants. Generating plants, and their transmission lines, are owned by the municipalities; but are operated in trust by the Ontario Power Commission which binds the co-operative venture into as solid an organization as though it were a corporation.

In theory each municipal unit must furnish the Commission with the same proportion of the capital needed by the particular power generating system, of which it is a part, as its power consumption compares with the power load of the system. The cost of the distributive system is apportioned according to the expenditure needed to get each governmental unit's share of the power from the

generating station.

Capital was not actually advanced by the lesser governmental units. In reality the funds came from the treasury of the Province and from the sale of bonds issued by it. The advances did not constitute a gift from the Province, but were merely loaned to the Ontario Power System with the understanding that the funds were to be returned in the course of twenty or thirty years. An amortization fund is being accumulated with which to retire the outstanding bonds when they come due. Current interest is likewise taken care of by income from the system. The Province has merely assumed a contingent liability and will be called upon to pay the bonds only in case the system is unable to do so.

The funds thus secured have been turned over to the Ontario Power Commission and have been used by it to secure power to satisfy the needs of the one hundred and thirty-one municipalities that are members of the system at the present time. Some power is purchased from privately owned and operated plants, but in the main it comes from generating plants owned by the system. The Ontario Power Commission has not pursued the policy of constructing all of its plants, but has constructed some of them and purchased others as expediency demanded.

RATES FOR POWER UNDER THE ONTARIO POWER SYSTEM



Members of the Ontario system get their power at a rate determined by the cost of supplying each of them with power. The final rate for each municipality is arrived at by allocating the generating costs, on the basis of the proportional part of the output of the generating stations used by that particular place, and transmission costs determined by the amount of capital used to transmit power to it. Thus communities far removed from the generating station pay a higher rate than those nearby.

Ontario's system of distributing the cost of power among power users places the burden of expense upon each locality, as nearly in accordance with the true cost of power as it is possible to determine them by modern accounting methods. Cities located near the power plants will ultimately be favored by such a system; but any discrimination which results in a stimulation of the cities near the power plants will be socially beneficial, due to the reduction of power losses caused by transmission. Localization of industries will cut down transmission wastes and other transmission expenses.

The high rates paid by cities more remote from the power generating stations need not be, and in fact, have not been a serious limitation to their possibility for development, because the cost of power is not as weighty a factor in some industries as in others. Localities with

high power rates have tended to develop industries in which power is not a major factor.

Ontario's system of rate making has already made its bow to the American public. It has been seriously considered by some of the state commissions and will, no doubt, be adopted in part, as its points of merit are better understood.

Power rates in the Ontario System cover such individual items of expense as operating expenses, the deferred items of depreciation and obsolescence, such overhead charges as are properly an obligation of the system, and sinking fund charges to pay the funded debt. The municipalities in the Ontario System pay a bill each month, at an estimated rate which it is thought will very closely approximate the real rate based upon the costs for the year. At the end of each fiscal period the accountants compute the cost and another bill is drawn up for each municipality which is presented as the thirteenth bill for the year. It renders a plus or minus account and credit is given or collection is made according to whether the estimated rate was too high or too low.

#### LOCAL POWER DISTRIBUTING SYSTEMS

#### IN

#### THE ONTARIO MUNICIPALITIES

The individual power user is not served by the Ontario Power Commission. The Commission delivers the power to the switchboards of locally owned retailing or consumer distributive systems. Local distributive systems have been financed, in large part, by the sale of municipal debentures. Customers of the local systems must be furnished power at cost, but no thirteenth bill is rendered, as in the case of the municipalities. Instead of the thirteenth bill, the rates to consumers are raised or lowered as deficits or surplusses make their appearance at the end of the year. Responsibility for the supervision of the local distributive systems rests with the Ontario Power Commission which acts in the capacity of a public utility commission when dealing with them.

In its public-service-commission capacity the Ontario Power Commission has the right to investigate cases where bad service conditions are reported, compel the municipalities to make rate changes, and otherwise keep the local systems functioning properly.

The success of Ontario's co-operative municipal plan has heartened the advocates of government ownership as a solution to the power problem in the United States. American proposals have taken a somewhat different slant and are more nearly allied to true government ownership (Federal or state), yet Ontario's plan is commonly called

Government ownership, although erroneously. Usually some other venture is bound up with American schemes, as typified by the linking up of nitrate fixation with Muscle Shoals, irrigation with the Columbia River projects, and many others that might be mentioned.

#### THE MURRAY REPORT

If one does not care to question the motives that actuated the National Electric Light Association in its study of the Ontario system and its comparison with American operating practices, one may say that the purpose of the study was to show definitely which is the better system. With this end in view, Mr. W. S. Murray was employed to make a thorough study of the Ontario system and the systems in California and to draw up a report of his findings. Mr. Murray was already very familiar with the electric power industry, because of his connection with the first superpower survey. As an aid to drawing up the report he was given access to all the information in the hands of the National Electric Light Association. Thus he was placed in a position when he could have made valuable contribution to the knowledge of the industry, had he so desired. In due time, a lengthy report was drawn up in which was set forth his comparison of the two systems.

Most of the conclusions of Mr. Murray's report and

the major portion of the text from which these conclusions were drawn consist of a reiteration of the stock arguments against government ownership. Few specific charges were brought against the system in Ontario or the Commission which administers it. In the first place, he concluded that the electric power companies in California furnish a better grade of service at a lower cost to the consumer than is obtainable in Ontario. Secondly, that certain construction works undertaken by the Ontario Power Commission at Chippawa and on the Nippigon were uneconomical, ill-advised, and typical of government operations. Finally, he alleged that the <sup>Ontario</sup> Power Commission is a judge of its own acts and, therefore, cannot be just.<sup>1</sup>

Practically all of Mr. Murray's statements have been replied to by the Ontario Power Commission. Sir Adam Beck, chairman of that body, has gone so far as to question the motives back of the "Murray Report". He accuses Mr. Murray of garbling the facts and of manufacturing a part of his data from the whole cloth.<sup>2</sup> In this reply the Ontario Commission goes to great lengths to point out the inconsistencies in the "Murray Report" and has not hesitated to deny charges and accusations and to question much

<sup>1</sup>Murray and Flood, Government Owned and Controlled vs. Privately Owned and Regulated Electric Utilities in the United States and Canada, pgs. 1-2.

<sup>2</sup>Ontario Power Commission. Re: Murray-Flood Report.

of the data upon which the conclusions were based.

The real weakness of the "Murray Report" is that Mr. Murray has ostensibly compared two systems which are not comparable, except in the most general way, since the policy of the Ontario Commission differs from that of the California Railroad Commission. It is the avowed duty of the Ontario consuming units to liquidate the bonded debt, whereas, the Railroad Commission of California considers it proper for the hydro-electric companies to maintain their capital investments in the projects and is opposed to any program of retiring capital by means of high rates. Under the theory held in California the bonds will not be, and in fact, cannot be retired. Power consumers of California are not paying for the plants, but the consumers of Ontario are paying for theirs. The different methods of arriving at rates charged in the two places are of enough importance to preclude any close comparison of rates in the two places. Elaborate analysis would be necessary before even an approximation could be arrived at between the two rating systems.

Complicated logical methods might be employed for the purpose of tracing the effects of high rates or low rates and their incidence. It might be shown that a rate for power in excess of its cost to the Ontario<sup>Power</sup> Commission amounts to a disguised tax levied upon the users of power,

or that a rate for power lower than cost is a tax upon the public for the benefit of power users. Neither can happen unless there is some flaw in the accounting system used to determine what the costs actually are. Mr. Murray attempted to analyze such cost movements and determine their incidence, but this task gained little headway for his argument. If the Ontario Power Commission is generating and selling power as cheaply as it could or would be furnished by private parties, there is little force to an argument regarding the incidence of the costs under the two systems. It is one thing to show that a governmental agency is or is not able to build a given plant and operate it as cheaply as would result were it under private direction, but it is much more difficult to prove that costs shared by different social groups in the two cases result in a greater gain in one case than in the other. There is force to the argument that, since, the properties of the Ontario Power System are untaxed the remainder of the property in the Province bears a greater burden, but this is evidence of a poor tax system, rather than an argument against government ownership and operation of the power projects.

Mr. Murray attempted to show that the pro-rating of costs under the Ontario system is essentially bad. He has pointed out that governmental costs cannot be justly

allocated, that the loss of taxes upon property devoted to public uses raises the levy upon that which remains in private hands, and, finally, that the governmental borrowings to effect the plan has raised the rates of interest against it for any other borrowing it may wish to do. He concluded that the Ontario system has put a burden upon taxpayers in general for the benefit of the few.

Mr. Murray also attempted to show that the pro-rating of costs under the Ontario system works a hardship upon communities located at a distance from the plants and that the rate-making system is cumbersome and involves a great many arbitrary decisions.<sup>1</sup> There is discrimination against communities, in so far as electric power costs are concerned, but any other rate-making system would result in discrimination, though of a different order; and it would fall upon different towns and would affect different interests. In case two cities pay the same rate for current from a common source, the city nearest the source of power is discriminated against, in that it pays more than its share of the total cost of the power, that is if costs are determined by the amount of capital and labor expended to make the service available for each place.

Mr. Murray's arguments regarding the distribution

<sup>1</sup>Murray Report, pg. 16.



of costs in Ontario and the United States are reducible to the following two: first, that the distribution of the costs of electric power between users and non-users is better in the United States, and secondly, that the accepted American rate-making scheme is more just as between power consumers than the one used by the Ontario Power Commission.

Mr. Murray took a definite stand against the plan and practices of the Ontario System and of any other system that involves the participation of the government in the power industry. It is but natural that he would arrive at the conclusions he did, since they were based upon the materials included in his report. The sources from which a great part of the Murray report was compiled are not open to a private investigator and we can but wonder with regard to the authenticity of the information advanced in support of some of the conclusions of the report. The impressions left by the report would have been better had the basic information been revealed.

#### GOVERNMENT OWNERSHIP IN THE UNITED STATES

In case governmental ownership of hydro-electric stations is attempted on a large scale in the United States it will probably consist of some form of Federal or State operation and ownership. A few municipalities have attempted

to develop water-power projects, and in some cases they have been successful, but the aggregate of such power developments is less today than it was ten years ago. Los Angeles is the outstanding example and is attempting to build up a municipal power system to serve its citizens. It has acquired a number of nearby power sites and is attempting to secure the right to develop a portion of the Colorado River as a back-log for future power needs.

The State of California was on the verge of entering the power field in 1921. Power companies in California fought vigorously and defeated the bill which was to provide for the voting of \$500,000,000 of bonds for the purchase of the electric utility companies. During the anti-public ownership campaign, and in fact one of the factors in the strategy of the power companies, was the movement to sell stock in the utilities to the consumers. After a large amount of stock had been sold the companies pointed out, that, since the stock was held locally and by a large number of the people, public ownership existed in fact and there was no need for a change to a different form of public ownership. The argument was so artfully presented and customer ownership gained such a foothold that the proposition to buy the utility companies was decisively defeated in the election. Customer ownership is now enjoying a deserved popularity, because

of its merits, although it started under rather trying circumstances and the men who sponsored it were actuated by questionable motives.

North Dakota officials under the Non-Partisan League regime drew up a plan for a state owned and state wide electric power system. Their system did not get beyond the blueprint stage and was never taken very seriously by the power interests. The State of North Dakota was not in a position to finance such a project and was not likely to be able to get in shape for it, since other activities were absorbing both the energy of its officials and its funds.

Federal ownership and operation or even state ownership and operation of some of the electric utilities may be attempted in the course of years, but before that time comes the present system of regulation will have been carried further than at present and found to be unable to cope with the situation.

The Federal Government is much better able to extend its power over power projects than is true of any state or group of states. In many cases hydro-electric projects and their kindred, the steam systems, are now too large for one state to manage; and, since they cannot be left to their own devices the Federal Government must actively engage in regulation.

Partly for the above reason, but mostly because

of its claim to the right to supervise navigation and administer the public lands, the Federal Government has been compelled to take part in the water-power situation. The Federal Government has gradually evolved a water-power policy and with the exception that the states have been allowed to define the riparian rights of all land owners it has a prior right to the regulation of water-power in those streams subject to its authority. This policy is now rather fairly well crystallized in the Water-Power Act of 1920. Until 1920 administration of water-power was left to the governmental departments. Fortunately some of the secretaries were opposed to the misuse of the government properties and attempted to serve the public interest by keeping water-power sites in the name and right of the Federal Government. The history of the Federal water-power policy is to be found in the records of these departments, rather than in the Congressional Record. No one cared much about it until such able champions as Pinchot and Roosevelt made a public issue of water-power and other natural resources.

## CHAPTER VI

### STATE VERSUS FEDERAL REGULATION AND CONTROL OF WATER-POWER DEVELOPMENT AND OPERATION

With the exception of Iowa and Texas, each state has provided machinery for regulating the public service companies within its borders. State regulation in each instance is effected by a commission which is entrusted with the function of guarding the public welfare by administering the laws passed by the legislature of the state. The legislatures and the administrative commissions, of the various states, have not differentiated between water-power projects and others, but have confined their activities to the general field of public utility regulations. Such water-power projects as have come into the public utility field have been regulated, but the others have been left alone. This policy has been sound, since the quantitative importance of non-utility projects in any state seldom warrants the establishment of a separate state commission or even an exclusive legislative treatment. Non-utility projects are both unimportant and outside the power of the state to control. Furthermore, they are decreasing in importance, both absolutely and relatively and should, accordingly, be disregarded by the states.

Until recently the actual regulation of water-power projects has been left entirely to the states, once the grant has been made, but the Federal Government has retained all its powers and rights even though in most instances it has no present intention of exercising them.

Whatever division of power is made between the states and the Federal Government will make it necessary for one of them to do the active work while the other looks on. Were each to stand by its rights, little more would be accomplished than could be done by either alone and certainly there would be much unnecessary effort caused by duplication.

Champions of states' rights have been more concerned because the number of projects subject to Federal control has not been definitely determined than with the extent to which Federal control has been exercised in any particular case. Most of the opposition seems to be due to the abandonment of the Laissez-Faire Federal policy existing up to 1920. Federal activity has been resisted by the states in all cases, but never more vigorously than when the public lands have been concerned.

Active Federal control of water-powers in the public lands has raised the ire of the public-land states, partly because the more effective Federal control is a reflection upon their own methods, but for the most part it

is due to the importance of the projects involved and the probability that Federal control will be permanent. The jealousy which has been aroused has resulted in attempts to circumvent Federal control by means of political jockeying, indignation meetings, and various other forms of influential methods.

The power of the Federal government to control the waters in the public land lies in the fact that it owns them in fee. Its fee is subject to state court interpretation and is not likely to change greatly, but the power to control other water-powers depends upon interpretations which the United States Supreme Court places upon the Constitution. Supreme Court decisions have changed Federal powers from time to time as new cases have come before it for review, and the flexibility of Federal powers is due to the general statements made in the Constitution and the interpretations which determine the extent and application of powers granted. All Federal powers are delegated by the Constitution and the lack of specific designations respecting activities and situations, that have become important since the Constitution was adopted, is taken care of by means of Supreme Court interpretations. Whatever right the Federal Government has is either read into the organic law by this body of judges or specifically set forth in the Constitution.

SOURCES OF FEDERAL AUTHORITY OVER WATER POWER

There are three clauses from which come the rights of the Federal Government to regulate certain of the water-powers in the United States. Congress has power over some projects because it, alone, may regulate interstate commerce.<sup>1</sup> The treaty-making power of Congress adds the international waters to the list.<sup>2</sup> Finally, Congress has the power "to dispose of and make all needful rules and regulations respecting the territory or other property belonging to the United States."<sup>3</sup> These three clauses extend to the Federal Government the control of eighty-five per cent of the nation's water-power resources.<sup>4</sup> Federal activities that have sprung up, as a result of the interpretation of these clauses, have not always gone unchallenged, but when the courts have been called upon to limit and define they have tended to increase rather than to decrease Federal authority.

Congress has the right to regulate interstate commerce which gives it control over that part of the water-power which is produced by the interstate navigable streams and over that portion of the power which is trans-

<sup>1</sup>Article 1, Section 8.

<sup>2</sup>Article 2, Section 2.

<sup>3</sup>Article 4, Section 3.

<sup>4</sup>Federal Water Power Commission, Third Annual Report, 1923, pg. 9.



mitted across state boundary lines, regardless of where the power is produced. Interconnection and large transmission systems will thus gradually bring control of the major portion of the electric utilities into Federal hands as the growth of large companies transforms the power business from a local one to an interstate business.

#### NAVIGABLE RIVERS AND WATER POWER REGULATION

It was not until 1884 that Congress decided to take control of the navigable waters, with the idea of specifying what works and structures might be built in or over them.<sup>1</sup> Since 1886 the metaphysical niceties of the law have been freely used to draw the line between the rights of the states, under their Police Powers, and the constitutional rights of the Federal Government. The line has been a shifting one and has shown a tendency to encroach upon the former preserves of the states. Federal poaching has gone so far that the states have practically no exclusive rights left in the water-power field, and are in danger of losing rights that have long been unquestioned.

A long line of court decisions has established the rule that the states have sovereign rights in the

<sup>1</sup>Federal Water-Power Commission, First Report, pg. 47, 1921.

waters of their streams, except with regard to the powers delegated to the Federal Government by the Constitution. The extent of the residual powers vested in the states naturally depends upon what interpretations are given to the clauses that convey power to the Federal Government. Two questions have arisen again and again as water-power development has progressed. The first has to do with the streams to which the Federal authority extends. What rivers does Congress have power to control because of its power to regulate interstate commerce? The second has been asked by those who would know the extent of Federal authority in the case of those rivers over which it clearly does have control. In short is there any limit to what the Federal Government may do?

#### EXTENT OF FEDERAL AUTHORITY OVER WATER-POWER

One of the many things the Supreme Court was called upon to decide, during the formative years of the Federal Government, was the meaning of the term navigability. In England, the Common Law had established the rule that the ebb and flow of the tide determines navigability. Sovereign authority applies only to the tide water reaches of the rivers in England. English precedent was disregarded by the American Supreme Court, when it made the decision which has been the precedent upon which some of the

American rules are based. American rivers are long and extend far inland where the sweep of the tide has no effect upon them; yet, they carry or have carried commerce in these fresh water stretches. Chief Justice Marshall was mindful of American conditions when he declared that navigation and navigability are questions of fact and that they can not be decided by an arbitrary rule.<sup>1</sup> Chief Justice Marshall's decision left the question of navigability unanswered and it became necessary for the courts to decide each case on its merits. Early Supreme Court decisions did not give Congress power over the upper reaches of the navigable rivers, but only to such portions as were navigable in fact.

In 1908 Theodore Roosevelt set forth a new principle. He stated in his message that no program of conservation could be successful unless each river system was considered as a whole. It was his contention that no system of river development should be considered, unless all the various uses of that river system were given proper consideration in the plan. In case his idea should become an accepted principle, and there is good reason to believe that it may be, in view of all the studies that have been made and reports that have been drawn up by the Federal Power

<sup>1</sup>Genesee Chief vs. Fitzhugh, 12 How. 443, 456-457.

Commission and the other Federal Commissions; the Federal Government may go to the head waters of any interstate stream, that is navigable in its lower reaches, and control the use of the headwaters. A material change will have been made in the nature and extent of the rights of the Federal Government, when the Supreme Court has an opportunity to decide whether or not the Federal Government has such a right. Should the Supreme Court uphold Roosevelt's doctrine, which is included in the Water-Power Act of 1920, it will be a limiting factor in the powers of the states and will cut down the size of the field open exclusively to them.

The other problem in connection with the Federal control of the use of navigable rivers is that of determining the extent to which its powers may be exercised. Federal powers have gradually expanded until, as codified in the Water-Power Act of 1920, the Federal Government has a great latent power which it may use when the need arises. The electric industry is now so definitely interstate in character that the limit of the Federal powers is, for all practical purposes, coextensive with that of the states' powers, since it may go as far as is necessary to insure the safety and well-being of its citizens.

#### INTERNATIONAL WATERS

Powers vested in the Federal Government, by virtue of its power to make treaties has resulted in little or no questioning by the states, although, the boundary and other international streams are receiving a greater amount of attention than any other group of rivers. International aspects of water-power, as they affect the United States and Canada, are dealt with by an International Joint Commission which was established for the purpose of adjudicating any disputes that might arise between the two countries. It has control over the St. Lawrence, the Columbia, and the Niagara rivers, but it has not been called upon to render any signal service, except in connection with the Niagara River. The Joint Commission has been one of the buffers between the United States and Canada, when they have considered the important questions of lake levels and the preservation of the beauty of Niagara Falls.

The lake level question has arisen because Chicago clings to the dilution method of sewage disposal. A very essential part of the Chicago sewage system is what is known as the Chicago Sanitary Canal. It consists, in part, of the Chicago River and a canal which cuts the divide between the Great Lakes drainage basin and that of the Mississippi River. Water is diverted from Lake Michigan through the old channel of the Chicago River, is

mixed with the offal of the city, and the whole mess finally is dumped into the Illinois River, where it causes pollution and an increased flood menace below the canal.

As long as present methods of sewage disposal are used by Chicago, the drainage canal is essential to keep the water supply of the city pure. When the sanitary system was begun, the Federal Government secured an agreement from Canada for a diversion of about four thousand second feet. This old agreement has not been changed, but the diversion is now between eight and ten thousand second feet. The city of Chicago has taken more and more water without permission and still needs to increase its diversion, if its engineers are to be believed.

Diversion through Chicago's Sanitary Canal is in addition to the regular drainage through the Niagara and the St. Lawrence rivers. Ten thousand second feet is a small amount of water, when compared with the regular drainage flow from the Great Lakes; yet, it is feared that unless this unnatural diversion is stopped or the flow through the Sault St. Marie and the Niagara rivers is regulated, lake levels will be lowered to such an extent that hundreds of millions of dollars must be spent to maintain satisfactory conditions at the present ports and harbors. If lake levels go down much more, it will be necessary to do an enormous amount of dredging to keep the channels and

harbors deep enough for the present type of lake boats.

The Great Lakes-to-Gulf waterway project, which is continually being discussed, makes the lake problems somewhat more acute, because whatever argument can be proposed for such a waterway is an argument to keep the Chicago Sanitary Canal open. Both Canada and the United States will be far from a satisfactory solution of lake and river problems as long as the Chicago ditch stays open and the outlet from the lakes is unregulated.

With the exception of the Niagara River, and possibly the St. Lawrence, the streams supervised by the International Joint Commission are not of great significance as immediately available sources of water-power. The demand for the development of the border streams is not urgent enough to enable them to compete with the streams and lakes located on the public domain. Writers play up the importance of the large rivers, but the power companies are engaged in developing the smaller ones.

### THE PUBLIC DOMAIN

The Federal Government administers the public domain as an owner in fee. It has all the rights and privileges of a riparian owner with respect to the streams located on its own lands and might have more were the Supreme Court to take a different stand with regard to allowing the

states to define property rights. Many state officials have objected to an unrestricted use of the public lands in the interests of the Federal Government. Especially strong objections have been raised in cases where there is apparently neither the intention nor the opportunity to release title to private parties. A short sketch will serve to present the questions involved.

Shortly after the organization of the Federal Government, the original states relinquished their respective claims to vast stretches of virgin territory, as a means of keeping down litigation that might arise out of conflicting claims to particular bodies of land.

It has never been conceded that the fee to this land was ever turned to the Federal Government. Instead, <sup>the title</sup> it is agreed that <sup>the title</sup> ↑ was merely given in trust for the public good and that the public land in each of the states is reserved to each respective state.<sup>1</sup> Since new states came into the union on the same terms as were enjoyed by the original thirteen, the same principle applies to them as well as to the original parties to the agreement. Practically all the land secured by the state grants was ceded to private individuals in the course of settling the territory of the United States. Since the Federal Govern-

<sup>1</sup>Pollards Lessee vs. Hagan, 3 Howard, 15 D.S. 391.



ment no longer has title to any appreciable amount of the land secured from the states, its authority is limited to the sovereign powers granted to it by the Constitution. As soon as the land was sold or ceded to private individuals, the title to the beds of the streams reverted to the states which thereby regained the powers that had been vested in the Federal Government. An easement for purposes of navigation was all that remained to the Federal Government.

States carved from the part of the public domain secured by purchase from foreign powers are on an equal basis with the original states. They have the rights of eminent domain which they may exercise against any party but the Federal Government. They have the same police powers as the other states and are in every way on equal terms with the older states.

The chief difference between newer states and the old ones is in the relatively large amount of public domain in them over which the Federal Government exercises authority and upon which it pays no taxes. No states have complained recently, but for a time many considered this tax exemption a great hardship, because revenue must come from other sources. Most of the privately owned land is of such a nature that it must be devoted to timber culture, mining, or power uses, rather than to agriculture.

Federal holdings are not decreasing in amount but are increasing as new timber reserves are added to the acreage already held. The question of depriving an honest settler of a home and of retaining title to a potentially valuable power site are not the same in the eyes of the Federal officials and it requires different arguments and conditions to secure release of the lands for each of these purposes. Power lands have been withdrawn from entry rather freely and until recently such lands have not been reopened, even after it was known they were not adapted to power purposes.

#### THE WESTERN POWER CONGRESS OF 1916

Some of the Western states have felt that they were subjected to absentee landlordism of a repellant type. They have considered the Federal land policy as something akin to benevolent despotism and have opposed it or attempted to shape the land policy of the Federal Government to their own ends. The power conference before the Internal Waterways Commission in 1911 gave the Federal officials an opportunity to express their opinions of the way in which the water-powers had been administered and to offer suggestions for a continuation of the work. The conference raised the ire of many who were active in fostering what they conceived to be the interests of the West.

Western politicians advocated that lands be turned over to the states. They complained because the Federal Government pays no taxes. They wanted this or that or something else but Federal interference. Their feeling of discontent found its expression in the Water-Power Congress held in Portland, Oregon, in 1915. Representatives from thirteen Western states met in Portland to discuss the Ferris Bill, then pending in Congress.<sup>1</sup> Apparently the meeting had been called to discuss the Ferris Bill, which was intended to clear up the questions that had grown out of the administrative policy towards water-power on the public domain; but the major part of the time of the convention was taken up by an argument regarding the merits of State control versus Federal control of water-powers. Some of the speakers warmed up to their subjects in true oratorical style and harangued the meeting to the general disgust of the Federal officials who were present. The hearing was so partisan and the speeches so charged with passion that practically nothing was accomplished by it.

A vigorous conservation program had been outlined by Roosevelt in 1908 and, under the leadership of the con-

<sup>1</sup>Official representatives were present from Arizona, California, Colorado, Idaho, Montana, New Mexico, North Dakota, Nevada, Oregon, South Dakota, Utah, Washington, and Wyoming.

servationists there had been a tendency to tighten the reins on the public lands. Because of his watchfulness government officials became more cautious and more careful with the natural resources than they had ever been before. The whole matter of water-power policy was brought to a head by the veto of the Rainy River Bill in 1906. The Western Conference of 1915 was the culmination of the fight of those who opposed this program. Public utility interests were in sympathy with the general discussion as they had been favoring State regulation in preference to Federal regulation. Gifford Pinchot had advanced a theory to explain their preference when he testified before the Internal Waterways Commission in 1911. He expressed the belief then that the utilities feared Federal regulation would be more effective than state regulation.<sup>1</sup>

The Federal Government has always exercised a measure of control over transmission lines and generating stations in the public domain. Federal regulation was at first restricted to the acceptance of plans of development and the specification of certain operating practices to guard the forests from fires and the public from injury by high tension lines. Control in the navigable rivers was undertaken in order that they would not be unduly

<sup>1</sup>Senate Document No. 274, 62nd 2nd session, p. 148.

obstructed by power generating works.

At first the states were able to keep the Federal Government from taxing river improvements or making a charge for the use of the rivers. The states bolstered their case by citing a number of court decisions which bore out their contentions.

In the Conference of 1911, a new argument made its appearance. No cases were cited, but the new principle seems to have been accepted as a rebuttal to the arguments set up by the states and is the one upon which the Water-Power Act of 1920 is based. The argument was to the effect that, since the Federal Government has the right to issue permits for the placing of structures in the rivers and to revoke them, it, thereby, has the right to specify the conditions under which permits may be enjoyed. Enlargements of Federal authority was then essential to any plan to protect water-power resources from those who would use them for gain. Since the states have conceded that the Federal Government has a right to tax project owners it is able to make the administration of water-power projects self-supporting and it is also able to capture excess profits that may escape state regulation of rates. The extent of Federal authority, the degree to which it has been exercised, and the lines of development it has tended to follow will be dealt with later as an introduc-

tion to the discussion of the present law.

FEDERAL VERSUS STATE REGULATION OF WATER-POWER

The controversy between the states and the Federal Government has led to some speculation with regard to which would be better. Although many have talked about the matter it has been the subject of but little scientific inquiry. There is little doubt as to whether the Federal Government should or should not exercise any control, but there is considerable uncertainty regarding how far Federal control should go. The states have had little or no interest in conservation, as such, and recent developments in the leasing of oil lands leads one to doubt whether the Federal Government has ever been deeply concerned about conservation. National officials were the first to enter into the conservation movement and they have prior claim to credit for the results of their campaign. Priority and experience should give them the right to continue.

In addition to rights growing out of experience the Federal Government has a better claim to the right to regulate rivers, because many of the tasks of river conservation are too large for any one state to attempt to specify what plan shall be followed. After development has been made, the states are, in many cases, unequal to

the task of control and must look to the Federal Government for aid and guidance. When river systems come to be considered as a whole, rather than as a number of unrelated projects, individual states can lay little claim to a right to interfere with the program of the Federal Government, but must be content to control strictly local companies and meddle with questions that involve the citizens of no other commonwealth.

It is in that border land of powers where the states are now active, but where the rights of the Federal Government are concurrent with them, that difficulty arises. How far must the Federal Government go to shape its ends? What degree of uniformity of rates and services are the inhabitants of different districts entitled to? Questions such as these are now perplexing the Federal Water-Power Commission, and it may not solve them within a decade or several.

Federal regulation of hydro-electric generation is in harmony with the conservation of national resources. Likewise, where uniformity of action and regulation is essential, as it is in this industry, a national program has much to recommend it.

The increasing importance of interstate regulation has made it more apparent than ever that the Federal Government will, of necessity, be called upon to regulate

in the interest of uniformity and effectiveness. There is a great deal of regulating to be done and the Federal Government might well be called upon to do more of it than at present. It has already been pointed out that the water-power interests are so bound up with the electric-power interests that it is practically impossible to separate them. There is no good reason why the Federal Government should not take over a part of the work of regulating electric-power generating companies. The State of Pennsylvania has already asked the Federal Government to assume control over several interstate power companies operating in it.<sup>1</sup>

A commission should be provided for supervising all of the water-power interests of the Federal Government. The present Federal Water-Power Commission, enlarged to proper proportions so that it could do justice to the task imposed upon it, might well be entrusted with this task. It is the logical body to take over all the power regulating work and care for all the Federal interests, instead of a part of them as at present. When such a commission is provided it should have the powers of an appellate body, together with sufficient powers of initiative to take care of the public interests. It must be able to cope with the

<sup>1</sup>Governor Pinchot, who was largely instrumental in securing the present water-power law, asked the Federal Government to take charge of several companies that were doing an interstate business and, hence, were too large for one state to control.



great power companies on equal terms and be able to make them do its bidding, or nothing can be accomplished.

## CHAPTER VII

### FEDERAL REGULATION OF WATER-POWER PRIOR TO 1920

#### RIPARIAN RIGHTS

It is a definitely fixed principle of the Common Law that no one owns the waters of a stream, but, instead, has a right to the usufruct. Proprietors of lands adjoining running water have certain rights to the water and each may use it in his business, provided he does not trample upon the rights of others. English courts have decreed that the natural flow of a stream is a part and parcel of the land<sup>1</sup> and the owner of the land may not be deprived of the use of the water without the right to mulct the taker in damages. In England the riparian owners may divert only such portion of the water of a stream as is necessary to their business and those who use water must return the residue to the channel, after they have finished. If the water is not returned to the stream the lower owners may collect damages from the guilty parties. Rights to the use of water are proprietary and may be held against the world, except with regard to rights vested with the Crown for the public good. Sovereign rights

<sup>1</sup>Brown, Rome G., Water-Power Policy, Senate Document No. 721, pg. 8, 62nd 2nd session.

apply to navigation and fishing and to nothing else.

English courts have defined the navigable portions of rivers as those swept by the ebb and flow of the tides. The English sovereign is empowered to make such rules and regulations as he deems necessary for the proper use of these navigable portions of the rivers; but sovereign authority is confined to acts that will best promote the public welfare. Riparian owners are subject to whatever rulings the Crown can or does make, but aside from such restrictions their rights are the same in navigable streams as in streams not subject to the Crown. English streams not influenced by the tides, and <sup>the</sup> non-navigable portions of navigable rivers are subject to no restrictions, except those imposed by the law of riparian ownership.

Riparian rights were so firmly established in the Common Law that the United States Supreme Court held, in an early case, that they could be changed neither by legislative enactment nor by treaty.<sup>1</sup>

American courts took over the law of riparian ownership, but made some changes in the definition of navigable waters. Our rivers are long and the tide affects them but little; hence, their navigability is a question

<sup>1</sup>Genesee Chief vs. Fitzhugh: op. cit. 456-57.

of fact which cannot be settled by an arbitrary rule.<sup>1</sup>

The United States Supreme Court has taken American conditions into consideration and has based its findings upon the facts of each case brought before it.

Each of the original states has accepted the basic principles of the law of riparian ownership, but has varied the details somewhat from the original doctrine. Some of the differences in interpreting the doctrine are to be attributed to a misunderstanding of the English Law, but in the main they are the result of new interpretations to fit new cases and conditions. Lack of uniformity has imposed restrictions upon the Federal Government and upon private interests, whenever they have attempted to exercise the rights of riparian owners. Private individuals operate on a small scale and have not been subjected to so many rules, but the Supreme Court has refused to remedy the situation. It is against the policy of the Supreme Court to inquire into the property rights as established by the highest courts of the states. The United States subjects itself and everyone else to whatever restriction the state courts have imposed.

#### THE LAW OF PRIOR APPROPRIATION

<sup>1</sup>Genessee Chief vs. Fitzhugh: op. cit. 456-57.

Not all of the state courts and legislatures have accepted the Common Law rules of riparian ownership. The more or less arid Western states are Spanish Law states and they have incorporated the rule of prior appropriation in their legal codes. This rule of the West is as much a result of necessity as of precedent, since the courts of the Western states might have followed the English precedent had they desired to do so. Water has always been of prime importance, to the people of the more arid regions, and their courts have recognized the right of the man who has been first to put the waters of a stream or lake to beneficial uses. Prior appropriation differs from riparian ownership in that the rights to running water are not treated as an appurtenance to land, but to the use to which the water has been put. Thus, water may be diverted from a stream and used for beneficial purposes and the owners of lower lands, that border the stream, have no remedy in the law, unless they have appropriated the water first. A grant to the land entitles no one to water, in case he does not elect to use it. The right to water can only be acquired by appropriation.

Eighteen states have provisions in their constitutions with regard to water.<sup>1</sup> The constitution of

<sup>1</sup>Alabama, Arizona, California, Colorado, Idaho, Louisiana, Michigan, Mississippi, Missouri, Montana, New Mexico, North Dakota, Oklahoma, South Carolina, Tennessee, Utah, Washington, and Wyoming. National Waterways Commission Report, 62nd 2nd session, 1911-12, pg. 307.

Colorado and New Mexico declare that the water in the public streams is the property of the public. The constitutions of North Dakota and Wyoming have reserved the waters to the state. In some cases, as in the constitutions of California and Idaho, all beneficial use of water is declared to be a public use; therefore it is subject to state control.<sup>1</sup>

The constitutions of the other thirty states are silent with regard to water and its disposition and use. Whatever rules exist in these states for the administration of water are the result of legislative enactment or of court decisions.

### FEDERAL POWERS

When the Federal Constitution was drawn up to serve as the basis upon which the union was to be constructed, the powers which were delegated to the Federal Government were set forth in it. The states which were a party to this agreement delegated certain powers to the central body, in order that the general welfare might be promoted thereby, but it was not their intention that the Federal Government should be the residuum of power.<sup>2</sup> All Federal

<sup>1</sup>National Waterways Commission Report, Senate Document, Vol. 15, 62nd 2nd session, pgs. 311-312.

<sup>2</sup>Pollards Lessee vs. Hagan, 3 How. 15, U.S. 391.

powers were delegated by the states and they were thus able to specify which ones should be exercised by the Federal Government and which ones should not be exercised by it. The conditions that applied to the original parties to the compact apply equally to the newer states as each has become a part of the union on the same terms enjoyed by the original thirteen. Thus, the newer states are also the source of powers and their rights are not diminished by the fact that they were not a party to the original agreements.

#### WATER-POWER AND THE CONSTITUTION

States in the union have such powers with respect to waters and water-power as may be exercised by the sovereign authority in the public interest, whereas, the Federal Government is limited to such powers as have been granted by the Constitution. Water-power is not mentioned specifically in the Constitution, but the Supreme Court has decided that the Federal Government has power over at least a part of the water-powers of the country. Chief Justice Marshall interpreted the commerce clause as giving the Federal Government authority over navigable streams and navigation.<sup>1</sup> This early decision has been the basis of a vast

<sup>1</sup>McCulloch vs. Maryland, 4. Wheat, pp. 316-437.  
Gibbons vs. Ogden, 9. Wheat, pgs. 1-240.

amount of power now vested in the hands of Congress.

Additional powers have accrued to Congress, due to its exclusive right to make treaties and to negotiate with foreign powers. Finally, the right to regulate interstate commerce has conferred upon Congress a vast amount of power which may be used in the field of water-power regulation as well as in that of transportation or other forms of commerce.

The water-power situation in the United States is determined by the existence of a number of rights, some of which are bound up with the proprietary interests attached to land, some are vested in the sovereign authority, and others are delegated to the Federal Government by the Constitution. Any consideration of the policy of the Federal Government towards water-power and water-power development must deal with the powers of the Federal Government not as an independent body of rights, but in relation to the other two groups of rights. It was early demonstrated that any law affecting water-power which could be expected to function must be in harmony with this three-fold division of powers, in order to receive the sanction of the Supreme Court.

As has already been stated, the commerce clause of the Constitution is the basis for the Federal regulation of water-power on the navigable streams. All the



rules which have been drawn up and the laws which have been passed to regulate water-power have been based upon the early interpretations of this passage. It is marvelous how plastic it has been in the hands of the Supreme Court.

When Chief Justice Marshall placed upon Congress the burden of the regulation of the navigable rivers the power carried with it the right to regulate any obstructions that might be placed in navigable rivers for any reason whatsoever. Later interpretations of this early decision have given Congress power over dams and other works used to generate powers.

Congress has control over a large amount of water-power, because the Federal Government owns a vast amount of land in fee. The major portion of this land is in the West and is especially well supplied with water-power resources. Towards the public lands, the Federal Government has all the rights granted to an owner in fee by the states in which the lands are located. Enormous land holdings and the right to control navigable rivers has placed the control of about eighty-five per cent of the water-powers of the country in the hand of Congress.<sup>1</sup>

<sup>1</sup>Federal Power Commission, 3rd Annual Report, pg. 9, 1923.

FEDERAL ADMINISTRATION NOT CENTRALIZED

Whatever policy exists and is being followed towards water-power has come from the governmental departments. It is the result of the merging of laws and the precedents of administration that have grown up in the governmental departments which were intrusted with the task of administering the laws that affected water-powers. Each department has had a distinct set of problems to solve and it was but natural that difference of opinion and practice should develop and continue. This tendency was counteracted in a measure by the softening effects of interdepartmental contacts, but has never been entirely eliminated.

The reader should not conclude that the Federal Government, or, as a matter of fact any government, has been interested in the question of water-power for any great length of time. Aside from the legal principles involving the rights of riparian owners and the establishment of the sovereign rights to control certain uses of the streams, the interest of governments in water-power dates from the use of electricity on a large scale. Many paper mill and cotton mill owners of New England have used water-power since before the American Revolution, but they generated power under the rights of riparian owners and hence were not subject to the control of either the nation

or the states. Absence of control was not an evil, because there was scarcely any need for control. More power sites existed near the industrial towns than were being used. The riparian owners were in no position to exact tribute under such conditions. Individual developments took but a few horse-power, in each case, and there was enough for all. Large water-power sites were not used at all, because there was no market nearby that could absorb the amount of power the principal rivers were capable of generating.

Much the same situation existed in the public land states, before the widespread use of electricity. There was either enough water under private control to take care of the power needs or else the water was taken in trespass on the public lands. Irrigation was and is the chief concern in the West. Manufacturing has been slow to develop there, because raw materials are scarce and the population is largely engrossed with agriculture and mining.

The navigable streams were in most cases far too large for anyone to develop for power. Some dreamers were talking of hydraulic, pneumatic, and electric transmission of power from Niagara Falls before 1880, but such schemes were generally considered as the idle talk

of fools.<sup>1</sup>

The Federal Government was not concerned about water-power for two reasons. In the first place, there were no problems over which it had jurisdiction and, secondly, it was so busily engaged in giving land away, to anyone who would accept it, that there was no time for anything else. It was necessary to change the generous Federal policy before anything constructive could be done in the water-power field.

#### LEGISLATION CONCERNING THE NAVIGABLE RIVERS

During the early period in the history of the Federal Government, the right to make improvement in navigation was delegated to the respective states, but the number of abuses and the increasing amount of improvements that were needed led the Federal Government to take a hand in the matter. The change in the Federal policy began with the Rivers and Harbors Act of July 5, 1884, which provided that the Secretary of War should report whether bridges or structures across navigable streams were interfering with navigation. The very same day Congress passed a special act which authorized the construction of the first power dam across a navigable river. During the next twenty years

<sup>1</sup>14th Census, Vol. 16.

a long series of such special acts were passed. Water-power grants followed a set form which was designed to impose conditions that would best protect navigation from the dangers in this new use of the rivers, but no attempt was made to protect the public interest in water-power.

The Rivers and Harbors Bill of 1890 provided that the consent of the Secretary of War must be secured before the construction of bridges, breakwaters, and other structures would be permitted in the navigable streams. Nine years later, Congress once more pointed out that it was the duty of the Secretary of War to keep the streams open to a fast declining navigation.

By 1889 it had become a fixed policy that the regulation of navigable waters should be under the direction and control of the War Department; but it was not until 1906 that any legislation was passed to guide the Secretary of War in the performance of his duties. Such projects as were built during this time were authorized by special acts of Congress after the plans had been approved by the Chief of Engineers of the Army and after Congress was thoroughly satisfied that navigation had been properly protected.

#### THE ACT OF 1906

Omissions from the Act of 1906<sup>1</sup> are more worthy of consideration than are its specific provisions. No mention was made of any charge which was to be made for the water-power resources devoted to private uses, nor was any limit set to the length of time water-power privileges might be enjoyed. There was nothing to lead anyone to doubt that the intentions were to grant in perpetuity, despite the provision that any amendments to the act would affect the projects authorized by it. The major portion of the law was made up of rules to protect navigation. Whatever works might be constructed were not to interfere with the right to use the waters for commerce and in case changes were necessary to this end, they were to be undertaken at the behest of the Federal authority, but at the expense of the developing company. The policy of the War Department was based upon the theory that the maintenance of navigation was the all-important consideration. There was no other public interest to serve.

The Act of 1906 made definite provision for the development of water-power; yet little or no development took place under its provisions. It was so indefinite with respect to some vital questions that few enterprisers were willing to risk their capital until changes had been

<sup>1</sup>34 Stat. 386.

made. At any time the owner of a structure and works might be compelled to make costly alterations and additions at his own expense. Then, too, there was fear that demands might be made at times when they could not well be met. What if the privileges were revoked? Would there be any compensation forthcoming? The law was as silent upon this point as upon the others.

The prohibition of assignments was the greatest deterrent of all. A large part of the capital used by utility companies is generally secured by selling bonds which, until recently, were almost always secured by mortgage equities. In case a plant cannot be assigned it cannot be mortgaged, with the result that any bond issue based upon the plant must have a claim that is not buttressed by this legal security. Until recently bonds not secured by a mortgage lien could not be readily sold and, even now, only well-established companies enjoy enough of the confidence of investors to be able to sell debentures. Projects that cannot be financed in part by borrowing are not usually built.

Congress did nothing until President Roosevelt brought the matter to a head by vetoing the Rainy River Bill in 1908. Two reasons were set forth in the veto message, namely, that no provision had been made to limit the time of the grant or to collect compensation for the priv-

ilege granted.

Mr. Roosevelt's firm stand made it evident that no further bills were likely to be passed under the Act of 1906. This clogging of the machinery, together with the increasing public interest in conservation, resulted in a new law which was passed June 23, 1910.

ACT OF JUNE 23, 1910

Most of the major difficulties were cleared up by the Act of 1910. No grants were to run for more than fifty years. Provisions were made for payment in case any grant were revoked and the works taken over for public use. It specified that all plans for development must fit in with a comprehensive scheme of development for the stream. Compensation was to be collected for investigations, the work necessary to restore prior navigability, and for benefits received from headwater improvements; but no attempt was made to charge for the privilege of using the stream. As before, the fate of the property at the end of the period was left in doubt and anyone who developed a water-power project did not know whether he could sell the property at the end of the period or not. Congress reserved the right to repeal or amend without liability, with exactly the same provisions as had been incorporated in the Act of 1906.



Since there was no acceleration of development, many people thought that something was still wrong with water-power legislation. Interest in water-power development was being aroused; yet Congress did nothing but talk. This conversational period was fruitful of results, even though construction did not go on. It unified the aims of the government and made ready for the next step.

#### LEGISLATION AFFECTING THE PUBLIC DOMAIN

While the Department of War had been zealously keeping open the highway for rowboats, logs, and other forms of river traffic the Department of the Interior had been wrestling with the difficulties arising in connection with the administration of water-powers in the public lands. The great variations in riparian rights in the several states made this administrative task more difficult than would have been true had one set of rules governed throughout. The Supreme Court's policy of sanctioning all riparian decisions of the state courts had increased litigation in the Western states that upheld prior appropriations. Prior appropriation was formally recognized in the public land laws of 1866 and 1870 in order that prior users would not be disturbed. Thus, rights which had been gained by sufferance became established against the Federal Government and were recognized by it.

During the nineties when hydro-electric plants began to be constructed in the public domains, these plants were occupied in trespass, or were authorized by statutes passed to provide for other things. There was no other way to do, except to curb development until legislation could be enacted. A measure of relief was secured by the passage of the Act of May 14, 1898,<sup>1</sup> which provided that the Secretary of the Interior might issue licenses for the generation of electricity in the public domain. In the opinion of counsel and the Secretary of the Interior, these licenses were revokable at will. Perhaps this condition was not such a handicap as those who were seeking a large return upon their investments attempted to make the state utility commissions believe. In fact, many enterprisers thought privileges to use water-power were granted in perpetuity and that the clause in the law which provided for revoking permits was merely a subterfuge to placate the public. Whether this was true or not enterprisers refrained from investing in hydro-electric plants in the public domain and little or no development took place. The real reason for the failure to develop was probably due to the keen competition between steam and water-power, but those seeking legislation had no such

<sup>1</sup>29 Stat. 120.

doubts.

Many people thought there was a causal relationship between the imperfections of the legislation regarding water-power and the fact that development lagged. They could not or would not see that the reasons might lie elsewhere. This conclusion is borne out by the fact that the clearing up of ambiguities and other objectionable points did not remedy the situation. Even the Law of 1898<sup>1</sup> which provided that easements on the public lands might be granted for power generation and transmission did not increase the popularity of public land power sites. Under the Law of 1898 easements were not to be revoked without cause and only by the action of courts of proper jurisdictions; but officials were as dissatisfied as before and urged Congress to pass a new law which it did three years later.

The Act of February 15, 1901,<sup>2</sup> superseded all previous statutes relative to the administration of water on the public domain. A number of laws were passed during the years that followed, but the Act of 1901 was the mainstay of the Department of the Interior until 1920.

A revocable license was the only water-power

<sup>1</sup>30 Stat. 404.

<sup>2</sup>Federal Power Commission, 1st Annual Report, pg. 46, 1921.

right that could be obtained by those who sought to develop water-power under the Act of 1901. Licenses so secured were further endangered because the patenting of the land during the exercise of the power privilege gave the settler a superior right to that held by the power company.<sup>1</sup> The settler was considered more important than the hydro-electric plant. No policy was even hinted at in this law. Whatever in the way of policy was developed grew up as a result of the foresight of the administrative heads of the departments involved. Mr. Pinchot, President Roosevelt, and others of their high character, seeing the clear line of cleavage between the interests of the public and of the private interests which were developing the opportunities in the water-power field, began to organize a body of principles that would serve as a guide for those who were to follow in their steps.

The conservation idea took root under their careful attention and soon many were actively at work saving the coal and other consumable resources for future generations. Conservationists soon became impatient at the obstacles in the way of the development of water-power resources and joined in an agitation for legislation that would inaugurate a water-power policy.

<sup>1</sup>Federal Power Commission: op. cit., pg. 46, 1921.

The first fruits of their labor was the Burton Act of 1909 which provided for the negotiation of a treaty with Great Britain regarding the preservation of the natural beauty of Niagara Falls. This treaty was accepted by Congress, May. 13, 1910.<sup>1</sup> Thus, provision was made for an International Joint Commission which was given the power to adjudicate differences growing out of the use or abuse of international waters. Since its inception this commission has taken up questions of pollution, navigation, irrigation, and water-powers in the international streams. It has served to the satisfaction of both the United States and Canada.

#### WATER-POWERS IN THE NATIONAL FORESTS

Before 1920 the administration of water-power legislation was further complicated because the forest policy of the United States Government resulted in the setting aside of large tracts of land to be administered under the Department of Agriculture. Another set of rules existed to govern the administration of the water-powers under the Bureau of Forestry of the Department of Agriculture. Rules were developed from the administrative acts of this department and were enforced more or less inde-

<sup>1</sup>36 Stat. 2448.

pendently of what the other departments were doing.

Up to the passage of the Water-Power Act of 1920, control of the water-powers, over which the Federal Government had authority, was divided between the Department of War, the Department of the Interior, the Bureau of Forestry, the International Joint Commission, the Department of Labor, and the Department of Commerce. Any uniformity of action and any policy that existed was not due to legislation, but to the common aims of government officials. Since the governmental departments had different functions to perform, it was to be expected that only a nominal amount of cooperation should exist.

Hydro-electric projects are quite often very large and transmission lines from them serve a great area. In many cases it was necessary, under the conditions prior to 1920, for a company or a group of companies to apply for permits from state officials and, in addition, to have dealings with two or more departments of the Federal Government. A transmission line might be subject to the control of two departments or it might be subject to Federal control over its entire length, merely because it crossed the public lands. For the most part, such authority was not exercised but it might have been and everyone knew that it could be. This condition was a stumbling block in the way of companies desiring to expand or to enter the

water-power field.

WATER-POWER CONFERENCE OF 1911

Unity of action was badly needed from the beginning, but the first definite move towards coordination was made in 1911 when Congress called for a Water-Power Conference to be held by the National Waterways Commission, in order that the testimony of men who were prominent in the various fields that would be affected might be heard and be made to feel that the Federal Government desired their cooperation. It was thought that the contact of conflicting interests would tend to disclose wherein differences lay and at the same time would bring about a better mutual understanding than had existed before.

The National Waterways Commission had several objectives in view. It wanted to know what limits the law had imposed upon Federal authority, the consensus of opinion regarding the merits and failing of Federal and state control; but it was especially interested in the extent to which Federal authority should be exercised and the reservations of authority necessary to take care of future contingencies, Congress wanted to know whether the Federal Government should extend its authority, as far as it could do so, or whether some powers should be reserved to the Federal Government, but delegated to

the states.

Gifford Pinchot summarized the conditions of the Governmental policy for the previous decade in the key speech of the session. He maintained that certain rights should be granted to the companies while certain other rights should be reserved to the public and that a wise governmental policy must harmonize these divergent interests. He pointed out that legislation must take both interests into account, if legislation is to remedy the evils. He set forth the desirable rights and duties of both in concise form and forcibly. They are reproduced below:

Rights that should go to the companies:

1. Certainty of tenure of property.
2. Irrevocable permits, except for breach of conditions, running for a fixed term of years. 50 years recommended.
3. Reasonable certainty regarding the rentals to be paid.
4. Provision for the adjustment of differences.
5. A fair return on the investment. In view of the hazardous nature of the undertakings, this should be higher than is commonly thought necessary. 10 to 15 per cent recommended.
6. At the end of the period, there should be fair compensation for all property taken.
7. The franchise period should be long enough to make the project a good investment.



The public also has rights, according to Mr. Pinchot. It should have:

1. Efficient service.
2. Equal service to all alike without discrimination.
3. A fair price to all consumers.
4. A reasonable time limit for franchises.
5. Information concerning costs and profits.
6. Honest capitalization on the basis of costs.
7. Fair rentals for the use of public property.
8. Interconnection to get its benefits of service and lower rate possibilities.
9. Prohibition of speculation in power sites by stopping the assignment of title, when for speculative purposes.<sup>1</sup>

Advocates of states' rights, the banking interests, the public utility companies, and the Federal officials each had an inning before the commission. Each was given an opportunity to express its views of the governmental policy and offer suggestions for reform.

#### THE FORERUNNER OF THE WATER POWER ACT OF 1920

A foundation for water-power legislation was well

<sup>1</sup>Gifford Pinchot before the National Waterways Commission, Senate Document 274, 1911, 62nd 2nd session.

laid in the conference of 1911, but it was nine years before any new law was passed. In the meantime, bills were introduced only to die in committee. No champion came forward to protect resolutions and bills from their enemies. The public had lost interest in water-power development and conservation, and Congress accordingly ceased to care much about it either.

Soon after the United States cast its lot with the Allies in the Great War, the increased commercial and manufacturing activities imposed a heavy burden on the power resources of the country. Coal was being consumed at a record breaking rate and became high in price. Every available installed power plant was being used more heavily than ever before, as the people strained every nerve to help the boys in France and the contractors at home. Scarcity of some of the munitions of war, namely nitrates, which could be supplied by synthetic processes that required a great deal of power in their use, aroused a new interest in water-power. In 1918, a second water-power conference was called by Congress to meet with a special Water-Power Committee.

#### THE WATER POWER CONFERENCE OF 1918

The war conference of 1918 was much more preten-

tious than the first one had been. More witnesses were called and more testimony was taken, in an effort to pave the way for legislation that would make water-power development possible.<sup>1</sup> Two years were required to draw up and pass a satisfactory law. By that time the war hysteria had subsided sufficiently so that it had little effect upon the Water-Power Act of June 10, 1920. With but few exceptions the Water-Power Act of 1920 was an embodiment of the principles set forth in the conference of 1911 and, accordingly, is a monument to the constructive genius of Pinchot and Roosevelt.

<sup>1</sup>The report of this conference was not printed for distribution, due to its confidential nature.

## CHAPTER VIII

### THE WATER-POWER ACT OF 1920

Even the most casual study of the history of the Federal policy towards water-power development is sufficient to disclose the need for uniformity of law and administration that existed up to the passage of the Act of 1920. A policy had been slowly developing, but it was a traditional policy which had been handed down from one official generation to another in the governmental departments entrusted with the administration of the laws that referred to water-powers. There was no one law or code of laws for each department to follow, much less one law which might be applied to all water-powers. Reformers had been attempting to secure changes that would centralize water-power administration, but it was not until 1920 that their attempts bore any fruit. The Water-Power Act of 1920 partly supplied the need for uniformity.

Although the Act of 1920 was the direct result of the Water-Power Conference of 1918, many of its provisions had been suggested and discussed in the Conference of 1911. All the provisions are embodied in it that are to apply to that part of the water-power development and regulation which had been entrusted to the various depart-

ments of the Federal Government.<sup>1</sup> Congress is vested with the right to determine what the policies shall be, but the administration of its laws are left to others, with the exception that Congress has never entrusted works constructed by the Federal Government to the discretion of the Department secretaries, as long as any vestige of political advantage could be gained by keeping the administration of them in its own hands.

Before 1911, interested parties had proposed that a commission should be provided to take over the administration of the water-powers under the control of the Federal Government. Three arguments were advanced to show why this commission, when provided for, should not be made up of cabinet officials.<sup>2</sup> Members of the President's Cabinet are first of all political appointees and the commission would, therefore, be always of one political complexion or the other. Secondly, Cabinet officials' tenure in office is very uncertain and, in any case, is not long enough for the officials to become familiar with their tasks, before new ones would normally take up the work.

<sup>1</sup>National parks, national monuments, Indian lands, and dams owned and constructed by the U.S. Government are not in the hands of the Federal Power Commission.

<sup>2</sup>Senator Walsh (Massachusetts), Debate in House of Representatives on Federal Water-Power Act, 66th 1st. Cong. Record, Volume 58, pg. 2.

Lastly, the burden of work thrust upon them is such that the major part of the work of the commission would be done by subordinates in various governmental departments.<sup>1</sup>

Despite the advice of men like Senator Walsh of Massachusetts, the Water-Power Act of 1920 is administered by a commission composed of the Secretary of War, the Secretary of the Interior, and the Secretary of Agriculture. It is assisted by a corps of subordinates, which is under its direction, and by a portion of the personnel of the three departments represented on it. The staff of the commission is made up of an executive secretary, who is in charge, and of those who have been permanently or temporarily assigned to it by the three departments. There is an engineering, an accounting, a legal, and an operating division.<sup>2</sup> The personnel of these divisions is all loaned, since the commission can make no appointments, other than that of the executive secretary.<sup>3</sup> Such an arrangement compels the three departments to cooperate in the administration of the laws. Thus there is no break with tradition and each department carries on the work

<sup>1</sup>Walsh (Massachusetts), Debate in House of Representatives on Federal Water-Power Act: op. cit. pg. 2.

<sup>2</sup>Federal Power Commission, First Annual Report, pg. 11.

<sup>3</sup>Ibid.

much as before, but under the guidance of a commission of three men instead of by three individuals.<sup>1</sup>

### JURISDICTION OF THE FEDERAL POWER COMMISSION

By the terms of the Federal Water-Power Act the Federal Power Commission is granted jurisdiction over waters used for power purposes.<sup>2</sup> It has jurisdiction when water-power sites are in the navigable rivers or in the non-navigable reaches of navigable rivers where the construction of dams for the generation of power would injure or affect the use of the stream for navigation. Likewise, its jurisdiction extends to waters on all public lands and reservations of the United States, except national parks, national monuments, allotted Indian lands, and to all dams or other works constructed or owned by the United States.<sup>3</sup>

A portion of the jurisdiction of the commission is absolute. It has the sole authority to dispose of the public lands for power purposes and is the only national or state body that may specify the conditions under which power lands may be occupied, together with the nature of

<sup>1</sup>Federal Power Commission, Second Annual Report, pg. 7.

<sup>2</sup>Ibid, First Annual Report, pg. 51.

<sup>3</sup>Ibid, pg. 52.

the structures that may be erected and maintained upon them. The remainder of its jurisdiction is concurrent with or supplementary to that of the states. The Federal Power Commission may specify what operating conditions the companies generating electricity under its authority must maintain, when equipment must be replaced, and what depreciation reserves must be put up to provide for replacements. Already, the Federal Power Commission has drawn up the accounting system which must be used by licensees.<sup>1</sup> It is empowered to require project owners to set up amortization reserves out of excess profits, if it so desires. Earnings above a specified reasonable rate upon the investment may be expropriated when the states have not made provision for regulating rates to this end. For rate-making purposes, it may allocate earnings between project and non-project works, transmission and generating equipment, or between any other functional parts of a project. Lastly, provision is made to regulate the rates charged for power, the service rendered, and the securities issued by those who have leased water-power sites under the Act of 1920. In case the states have made no provision to protect their citizens by taking charge of these same functions the Federal Government is ready to assume the responsibility. Intra-state rates may be regulated in case

<sup>1</sup>Federal Power Commission, Second Annual Report, pg. 5, 1922.



a state has made no provision to regulate them. Texas and Iowa do not now have utility commissions and might have their water-power companies regulated by the Federal Government, should it care to do so.

Interstate rates and service may be regulated, where the states involved have made no provisions to handle the question or cannot agree with regard to the problem at issue. The Federal Power Commission has residual powers which are practically coextensive with those of the state commissions and, although not used, are being reserved for possible future use. Where the jurisdiction of the Federal Power Commission is concurrent with state commissions, it is the avowed policy of the Federal Government, as set forth in the Act of 1920, and it is the intention of the Federal Power Commission, to leave as much work to the local governmental bodies as is consistent with the operation of the projects.<sup>1</sup> The Federal Power Commission does not intend to use all its powers, unless there is need to do so. It has enough work now without taking on more.

#### POWERS OF THE FEDERAL POWER COMMISSION

The powers of the Federal Power Commission are set

<sup>1</sup>First Report, pg. 55.

forth in the act which it administers. It may specify rules and regulations of procedure to be followed by applicants. It has power to use such means as are necessary to secure information needed for the performance of its duties. New and old projects (not under other legislation) are to be regulated and supervised. Finally, it has power to bind the United States Government in the contractual relationship arranged with the licensee. These powers, when exercised in the general field to which they apply, have resulted in a variety of activities not mentioned in detail. The Federal Power Commission may deal with those who are seeking licenses and with those to whom licenses have been granted. After a license has been granted the United States Government is one party and the licensee is the other party to a contract. It is then the duty of the Federal Power Commission to protect the interests of the United States and those of the licensee by performing the duties that have been delegated to it and to require that the licensee do likewise.

#### DUTIES OF THE FEDERAL POWER COMMISSION

The duties of this commission may be classified as administrative and regulatory or supervisory. Its administrative duties are more or less routine in character and include such matters as the receiving and advertising

of applications, the holding of hearings, the issuing of permits and licenses, the conducting of investigations of projects under application, the collecting of annual charges levied upon the licensees, and the assessing of benefits from headwater improvements. A large share of the time of the commission has been taken up by routine matters, but as the available water-powers are put under lease, the administrative duties will be superseded by some of the regulatory ones.

Special studies have been and are being made of the major river systems now under the control of the Federal Government, in order to determine which uses are best for each system. Most of the plans to develop the major streams have been before the public on various occasions, as the result of the publicity which naturally comes when partisans disagree. The projects have quite frequently been ambitious to a fault and their adoption would have involved greater expenditure than the product of the stream would warrant.

Projects already constructed at the time the Federal Power Commission came into being are to be valued as soon as the work can be done. Valuation has been indefinitely postponed until the work of project examination has been taken care of, since this is conceded to be the more important. When valuation finally is made, the same condi-

tions may be imposed upon projects constructed under the direction and control of the commission and those which were constructed previously.

Regulation has been instituted because the government officials responsible for the Act, believed that nationally owned natural resources should not be used by private individuals as a source of unreasonable profits.<sup>1</sup>

The Federal Power Commission is the guardian of the nation's water-power resources. It may compel the enterprisers in the water-power field to turn over to the government, through amortization reserves, profits in excess of a reasonable rate of return, when the states have not made a provision to do the same thing through rate adjustments. It may collect from the companies that portion of their earnings in excess of a specified reasonable rate of return upon the present investment, which is set forth in the license. The examination of annual reports made out by the licensees is a part of its procedure of regulation. That portion of the duties of the commission which is connected with its powers to regulate rates, service, and securities is of great potential importance, but will not be exercised until the regulatory system of the states breaks down or until it is desirable to supplant

<sup>1</sup>Federal Power Commission, Third Annual Report, pg. 8, 1923.

the state system by Federal regulation.<sup>1</sup>

The acts that the Federal Power Commission may do are the embodiment of the policy of the Federal Government towards the water-powers of the country. An enumeration of the duties and obligations placed upon the licensees are but another way of expressing the same ideas.

#### DUTIES AND OBLIGATIONS OF THE LICENSEE

Not only is the Federal Power Commission the guardian of the public interest, but it is also the guardian of the interests of those who engage in the business of producing and using water-power. A great deal of financial responsibility is essential in order to successfully finance and maintain hydro-electric projects; hence, the protection of public and private interests necessitates a considerable amount of cooperation between the Federal Power Commission and the licensee in order to keep ill advised expenditures to a minimum and to protect the public and the operating companies from unscrupulous promoters. A successful applicant for a water-power privilege has not performed all his duties or met all his obligations to the Federal Power Commission when he has made plans that conform to the requirements of the commission; has constructed

<sup>1</sup>Federal Power Commission, Third Annual Report, pg. 55, 1921.

a plant satisfactory in all requirements; has furnished the commission with details of its cost; and, has given proof that he has conformed with state laws. In addition, he must maintain his plant in good operating condition. Worn out or obsolete equipment must be replaced and sufficient depreciation reserves are to be set up out of current operating revenue in order that replacements may be financed. The licensee must use a system of accounts that is satisfactory to the commission, whether the project is a public utility under state control or a commercial company. An amortization reserve must be set up out of profits in excess of a "specified, reasonable rate of return upon the actual investment." This reserve may be charged off against the investment in the project, thus reducing the amount upon which a reasonable rate of return need be allowed.

No licensee secures rights and privileges free of charge, but must make reasonable annual payments to reimburse the government for his share of the cost of administering the Water-Power Act, for the use of the lands and property of the United States. In the absence of rate regulations, he must turn over excess profits arising from the use of the plant. The obligation to turn over excess profits will arise almost exclusively in the case of unregulated commercial companies.<sup>1</sup> Finally, he must pay his

<sup>1</sup>Section 9 (e).

share of the cost of headwater improvements that benefit the project. Such a formidable array of duties and obligations is not without its compensations. More restrictions are imposed upon the licensee than before 1920, but he has more rights to counterbalance them and is assured of the definiteness of his tenure.

WHAT THE LICENSEE GETS UNDER THE WATER-POWER ACT OF 1920

The licensee secures a preliminary permit soon after making application which insures him of the maintenance of the priority of his claim, until he has had time to prepare proper plans and specifications and secure their acceptance. Later, when a license has been secured, he is a party to a contract which is specific in its conditions. He knows how long the license is to run and that he will not be ejected before it expires. His license is irrevocable, except for breach of conditions. If the construction is not started within the time specified, the license may be revoked by executive authority; but once construction has begun, he may be reached in no way except by judicial action and the license will not be revoked except upon the failure of other legal remedies. During the time the license runs, the licensee may attempt to secure a reasonable return upon his investment by operating the plant. No strict regulation is to be imposed upon him until after

he has secured such a reasonable return and more.<sup>1</sup> Finally, he has a chance to secure an extension of the license at the end of the period; but in case he does not secure such an extension, proper compensation will be given for the net investment in the project at the time it is taken over by another.<sup>2</sup>

Thus, the conditions under which licenses are now held are much more favorable to the licensee than before the Water-Power Act was passed. Certainty is a prime requisite in order to attract capital into a productive enterprise where there is little prospect that handsome profits can be made. Certainty of tenure has been increased by the Act of 1920, if not certainty of income. Whether the times are ripe for development or the law is more favorable than formerly is not certain, but development of water-powers has been progressing at a feverish rate since 1920 and has not slackened until last year, 1924.

#### CHANGES RECOMMENDED BY THE FEDERAL POWER COMMISSION

The reader has been led through the maze of de-

<sup>1</sup>Federal Power Commission, First Annual Report, pg. 57, 1921.

<sup>2</sup>Water-Power Act of 1920, Section 15.



tail surrounding the relation of the commission to its wards. It now remains for us to consider the defects in the Act and the criticisms and recommendations of those who have given the matter their attention.

Mr. Merrill, Secretary of the Federal Power Commission, has recommended certain changes which would affect the operation of the Water-Power Act of 1920 and the activities of the Federal Power Commission. According to Mr. Merrill, the Federal Power Commission desires to appoint its own personnel and to increase the size of its staff. With the staff now at the disposal of the Commission, it has been necessary to slow up the work and hold up applications until they can be handled, or else to issue franchises with but a superficial examination in order to get the hydro-electric development under way as soon as possible. If the process of unification is to be carried forward, the Federal Power Commission has recommended that all water-powers, whether licensed under existing or prior laws, be administered by that body.<sup>1</sup> There is apparently no good reason why it should not be given these added powers, except the inadequate staff at its disposal. Any new duties would make the work progress more slowly than it now does, unless additional personnel were secured.

<sup>1</sup>Federal Power Commission, First Report, pg. 16, 1921.

The last recommendation by Mr. Merrill is that the Water-Power Act be amended to provide that moneys collected from licensees be set aside in a special fund to be expended under the direction of the Federal Power Commission.<sup>1</sup>

CRITICISMS BY THE FEDERAL POWER COMMISSION

Each year the annual report of the Federal Power Commission has carried practically the same complaints: namely, that the Commission is overworked; that the field force is unable to keep up with assignments; and, that neither the Commission nor the Departments have been able to make investigations of a character or to enforce the safeguards contemplated by the law. It has not made valuation of projects brought under its control as provided for. Instead of reducing the bodies with powers to administer the water-power policy from three agencies to one, a fourth has been added. This not only increases the cost of administration, but makes it impossible to segregate the costs in order to determine what the total costs of administration are.<sup>2</sup> The most forceful of all the criti-

<sup>1</sup> Federal Power Commission, pgs. 15-16, 1921.

<sup>2</sup> Ibid, pgs. 15-16.

cisms is that the commission has not been entrusted with the enforcement of the Act to the proper extent. There is no good reason why it should not be so entrusted. It should take care of all the water-powers under Federal authority instead of just a part of them. Where the Government has constructed a project the commission has no power to act in any capacity. Muscle Shoals and all other government owned plants are subject to Congress rather than to the Federal Power Commission.

#### OUTSIDE CRITICISMS OF THE FEDERAL WATER-POWER ACT

State

New York<sup>1</sup> filed a bill in the United States Supreme Court against the Federal Power Commission, June 24, 1922, by which it sought to estop the Federal Power Commission from applying certain provisions of the Water-Power Act of 1920 to the waters within its boundaries. This case arose because, in 1921, the New York legislature had passed a Water-Power Act which was essentially like the national law in theory and in application. New York wanted the exclusive right to regulate water-powers within her borders and was willing to contend for that right. The contention was that the Federal law was unconstitutional. After a conference held May 10, 1923, the New York State Power Commission recommended to the governor

that the suit be withdrawn,<sup>1</sup> but the suit had not been withdrawn at the time the third report of the Federal Power Commission was printed in 1923.

Congress has been the scene of other attacks upon the Water-Power Act. Bills have been introduced from time to time for the purpose of making special water-power grants, outside the jurisdiction of the Federal Power Commission. All of these bills have failed to pass, but they threatened the Act of 1920 and show that not everyone is completely satisfied with it. Congressmen have introduced bills providing for everything from grants to individual companies to those which provided for the creation of great superpower systems which were to be under the control of a new non-political commission especially designed for the task it would be called upon to perform.<sup>2</sup>

A plank in the Democratic national platform of 1924 was opposed to the Federal water-power policy and the Water-Power Act. No grounds for the attack were given, except that it was considered to be inimical to democratic institutions. It is doubtful what the Democrats would do to the Water-Power Act, if they had the opportunity. They say they desire to repeal it.

<sup>1</sup>Federal Power Commission, Third Annual Report, pg. 27, 1923.

<sup>2</sup>Norris Bill, 1924.

RESULTS ACCOMPLISHED BY THE WATER-POWER ACT OF 1920

The Federal Water-Power Act has now been in operation for four years. Whether it is due to the economic conditions since 1920 or to the more favorable provisions granted licensees is not certain, but, whatever the reason may be, more water-power development has taken place than had ever been attempted before under Federal authority.<sup>1</sup> At the end of the first three years, the commission had issued permits for the development of 7,500,00 horsepower and of that amount projects with a total capacity of 2,400,000 horsepower had been built or were being built.<sup>2</sup>

In addition, the commission has made a number of special studies of river systems to determine the best plans for development of all the resources of the various rivers. A system of accounts has been drawn up as a guide for project owners to follow. Lands have been restored to entry by the commission and a number of acts of a routine nature performed.

The first four years under the Federal Power Commission have seen more water-power development than had

<sup>1</sup>Federal Power Commission, Third Annual Report, pg. 1.

<sup>2</sup>Ibid, pg. 1.

ever been attempted before under Federal authority.<sup>1</sup> A step has been taken towards the establishment of a Federal power policy which many think will result in the greatest good to the greatest number, although it is doubtful whether or not that result can be accomplished without additional legislation. It now remains for us to inquire into the matter of the present status of the Federal Water-Power Policy and to determine, as far as we may, wherein the present policy is not working to the best public good.

## CHAPTER IX

### SUGGESTIONS FOR A FEDERAL POWER POLICY

The Water-Power Act of 1920 has set at rest many doubts as to whether the Federal Government actually has any intention of developing a water-power policy. Up to the passage of that act whatever water-power policy existed was to be found in the traditions which were being handed down from one government official to another. Whatever uniformity of action and unity of purpose existed was due, in large measure, to the men who were interested in the advancement of the use of water-power and at the same time were desirous of protecting the public interest in the natural resources. They weighed and judged the cases that came under their observation and their suggestions to Congress embodied the principles they discerned and the methods thought necessary to attain proper ends.

Despite this background of experience, which was drawn on by those who drafted the bill, the present law is not entirely satisfactory, either from the standpoint of those who administer it or the public it supposedly protects. Very few have criticized the basic ideas embodied in the Water-Power Act of 1920, but there are a number of details which need to be changed to help along the Government's program.

There is little reason why the entire Act of 1920 should be criticized. True enough, the Federal Government is not now in a position to secure all that it wishes by means of the present organization, but intentions have been declared and failure to attempt to arrive at the ends set forth is a neglect of duty rather than a lapse from traditional procedure, as would be the case without the law.

The present Federal water-power policy is designed to foster and protect the public interest in the natural resources, to the extent that water-power is a part of them. Water-power is but one of several uses to which a river may be put and, since the various uses of the rivers are usually exclusive the continual disputes have made it necessary that the Federal Government appoint itself referee. Accordingly, it is prepared to encourage the development of water-power by the construction of additional works, wherever water-power is considered the most desirable.<sup>1</sup> Desirable water-power development is to be brought about by removing as many obstacles now standing in the way of development as is consistent with the protection of the interests of the public.

Its policy of encouragement has been confined to

<sup>1</sup>Federal Water-Power Commission, First Report, pg. 16; Second Report, pg. 7.



licensee  
one of clearing up ambiguities of contracts and making them safe for the public and certain in their statements of the rights and obligations of the licensee. The practice of subsidy grants, such as the railroads enjoyed in the early years, has not been practiced or even thought of as private enterprises are eager enough to develop the power sites, if opportunities are not burdened by onerous restrictions.

Private interests, as in times past, are being encouraged to enter the water-power industry by being offered opportunities to extend operations in that field, but their operations are now more restricted than was formerly the case.

Private operation under governmental supervision is the accepted plan and the one most likely to remain, but the way has been left open for other forms of ownership.<sup>1</sup> It is not to be expected that even such a definite commitment to private ownership and public regulation as the Act of 1920 would slam the door in the face of public ownership and operation.

The reservation of regulatory powers to the Federal Government is an expression of the belief that regu-

<sup>1</sup>Municipal ownership and operation has been favored in the act and the way has been left open for the Federal Government to take over all or any of the properties on the expiration of the leases.

lation is a permanent governmental function. Likewise, these same reservations are evidence of the fear that, due to the imperfect character of the present regulation by the states, the Federal Government may be called upon to supply the deficiency. The Federal Government has no intention of poaching on the preserves of the states so long as the states are able to maintain a semblance of control over their charges.<sup>1</sup> Each state is to be permitted to exercise control over operating companies within its borders until such control breaks down or it no longer attempts to regulate them in the interest of the public. In that case the Federal Government may step in and assume control. It has reserved the power to do so.

There has been no break with the past regarding the long accepted notion that private interests should be given the right to engage in the power business and to make a reasonable profit by so doing, but that ownership of water-power resources shall not pass into private hands.<sup>2</sup> In the interests of national economy it is deemed wise that all projects conform to a plan for the best use of the rivers. All companies must consult the government with regard to the best plans to follow and the government looks

<sup>1</sup>Federal Water-Power Commission, First Report, pg. 38, 1921.

<sup>2</sup>Ibid., Third Report, pg. 8, 1923.

to the interests of the companies over which it is exercising authority. Apparently the government has learned from its study of the railroads that certain types of economic endeavor are naturally monopolistic in character and should be encouraged to this end. Recognition of monopolistic tendencies has served as a deterrent to over-zealous attempts to curb monopoly. Combinations in restraint of trade are specifically prohibited by the Water-Power Act of 1920,<sup>1</sup> but monopoly is not. Restraint of trade is to be sharply differentiated from monopoly. The exclusive right to sell power in a community does not give the company enjoying that privilege any reason to think it has been authorized to withhold power, to discriminate between users of power, or otherwise to conduct its business in a manner now recognized as unbecoming to public service operations. Likewise, lessees are expected to make whatever income they may by operating the projects they have developed, rather than by holding leases undeveloped in an attempt to sell them at a profit. Speculation in leases is now forbidden.<sup>2</sup>

Plants constructed before 1920 and those to be constructed under the Act of 1920 must be maintained in

<sup>1</sup>*Water Power Act of 1920*  
Section 10.

<sup>2</sup>Water Power Act of 1920, Section 13.

a manner consistent with the needs for good service.<sup>1</sup> The Federal Power Commission is pledged to see that interstate rulings, with regards to service to be rendered and the charges which are made for that service, are as uniform as possible. The Federal Government does not intend that the hydro-electric companies shall charge rates that will yield more than a reasonable return upon the actual investment of capital in the project at any given time,<sup>2</sup> but that the consumers shall secure their power at the lowest rate consistent with the reasonable demands of the power companies.<sup>3</sup> It is recognized that the public has a right to know what the costs of generating power by water really are.<sup>4</sup> A uniform accounting system was devised by the Federal Water-Power Commission to enable state and Federal officials to get at the facts in such a manner that comparison might be made between the various producing companies and power projects. After the Government has secured the facts it may appropriate the earnings which are in excess of a reasonable rate upon the actual capital investment. In case the states make no

<sup>1</sup>Federal Power Commission, First Water-Power Report, pg. 56, 1921.

<sup>2</sup>Ibid., Third Water-Power Report, pg. 8, 1923.

<sup>3</sup>Ibid., First Report, pg. 59, 1921.

<sup>4</sup>Ibid., Third Report, pg. 3, 1923.

provision to cut down this return, by changing their rate schedules, the Federal Government may take this unearned increment.<sup>1</sup> No provision has been made for the use of funds so secured, but it is thought they will be used for making improvements in the river systems.

Differences between the points of view of the public and of private parties were clearly recognized before the passage of the Act of 1920 and the differences were harmonized, as nearly as possible, since, private capital and initiative must be depended upon to develop water-power and extend the uses of power. It was a wise course for the Federal Government to compromise, in order that development might go forward without delay.

Differences between the public and private points of view extend to the electric power industries which are closely bound up with water-power. The establishment of a water-power policy by the Federal Government is but a partial solution of a greater problem. In some sections of the United States, water-power carries but a small part of the power burden. In these regions, the water-power projects are connected with the regular power system in such a way that they merge with the system. When steam and water-power projects have been merged the regulation

<sup>1</sup>Federal Power Commission, First Annual Report, pg. 61, 1921.

of water-power alone is a difficult, if not impossible, undertaking. A Federal power policy is needed to meet such conditions. There is evidence that such a policy is in process of formation. A few more superpower surveys will determine the nature of this larger policy; but even now it is evident that the Federal Government is extending and continuing its superpower surveys in order to encourage the best coordination between steam and hydro-electric plants. The power systems that will emerge as a result of encouraging the use of giant power will enable industries to secure power at a lower rate and will undoubtedly increase the amount of electricity used. When giant power has possession of the power industry the water-power policy of the Federal Government must be merged with the power policy, if the most good is to be accomplished and the best interests of the public served.

Many prominent men in the electric utility field are cynical regarding the prospect of what will happen if the Federal Government begins to dabble in their chosen field. They see little good and much harm that may result from too great enthusiasm engendered by the superpower surveys. Some are now contending that there is little to be gained by tying up several large central steam plants into one great system in order that power may be interchanged. They argue that such systems increase the load, but do not

improve the load factor ; hence, nothing is to be gained thereby. The proof of this argument lies in the present load factor conditions of the large systems. Load factors rarely exceed 40% and in many cases are less than that. If their argument is true, then the chief advantage of centralized steam-generating systems come from the economies that may be secured by locating the plants near fuel and condenser water.

There is a need for a Federal power policy, if the water-power policy is to be made effective. A power policy need not be revolutionary in its theory, or embrace radical doctrines, as there is no occasion to banish private enterprisers from the power field. In many ways it would be advantageous for all concerned if regulation of certain phases of the activity of the power companies were exercised by the Federal Government. The true gain from the introduction of such a program would be the resultant of its good and bad aspects. It is doubtful whether any gain would result from a surrender of regulatory rights now exercised by the states and other local governments, since the power industry has not become interstate to the same extent as the railroads have. Where the problems are local there is much to be gained by permitting local governing bodies to cope with them, but where problems cease to be local in character, the Federal Government can

render a distinct service by cooperating with the local bodies in their attempt to find a solution to inter-district problems.

### NEED FOR A NATIONAL POWER SURVEY

As one of the first steps in the development of a power policy the Federal Government should make a power survey of the United States in order to determine the present and future power needs, together with the character and size of the organizations and systems now developed to supply them. This study should take the form of the superpower survey of the Boston-Washington area and should be as detailed as is consistent with the size of the task and the nature of the information sought. Engineers making the survey should locate power sites for steam-generating plants and hydro-plants, with the idea that they would ultimately be interconnected to form a system that could furnish power to the best advantage. Engineers may speculate as they please with regard to the uses to which the power may be put as long as they contribute to the knowledge of how and where the power should be generated.

### A PROPOSED PLAN FOR POWER CONTROL

The territory comprising the United States should



be divided into power districts, the size and boundaries of which should be determined by the information disclosed by an adequate survey. Each district should be large enough to enable the company or companies engaged in the power business within its boundaries to realize most of the advantages of interconnection and large scale operation. On the other hand, no district should be so large that it would embrace wide differences of economic interest. The boundaries of each district should be determined, in large measure, by the power systems now in operation. Ten districts would probably be enough. Once the districts have been established, their boundaries should not be changed without good reason.

Power companies, in the various districts, should be permitted to expand, either by extending their lines or by purchasing the plants of others, but should not be permitted to own plants or distributing systems in any other territory than their own. No major lines, other than inter-connecting transmission lines, should be permitted to cross district boundaries and all transmission lines should be considered as common carriers. In many ways such a system would resemble a railroad system after a district consolidation. It would be compact and highly centralized.

Powerful financial interests are now engaged in

absorbing the existing operating companies and in extending the present power system. The primary purpose of each public utility holding company seems to be that of building up a system that will earn as great or as steady an income as possible. Most of the holding companies have acquired properties that are widely scattered and consequently unrelated. Around such nuclei they are building relatively small systems. Small plants often come into competition with other systems owned by rival and more powerful interests and the energies of both parties are in many cases largely dissipated by the struggle that usually results from such competitive contacts. Strategic plants shift into stronger and stronger hands while the weaker plants struggle along, under more or less incompetent management, until they become desirable additions to the stronger systems. If financial interests, as embodied in the holding companies, were compelled to confine their holdings of securities to the operating companies of one district, the managerial ability of each holding company would be localized in its application. As a consequence, the managers of each company would ally themselves with the interests of one district. They would find their interests bound up with the industries of their district and would be eager to enter into plans for promoting the interests of their respective districts. Power companies

would be developed on a district basis much more quickly under a restricted system than would otherwise be true. There is as much evidence of the desirability of this procedure that I am led to conclude that the holding companies should be organized on a district basis.

A dozen or more of such holding companies are now in the power field. Districts of the size proposed would be large enough to engage the interest and absorb the energies of one or more of the existing companies for many years and would curb much competition that otherwise will result in wasted effort and inefficiency.

The operating companies and the managing companies of each district, as far as their interstate business goes, should be subject to the control of a district commission. The members of this proposed commission may well be selected jointly by the Federal Government and the states included in the district. Each state interested should have representation on the proper district commission while the Federal Government should also have representation. The board members should be appointed for a term of from six to ten years and should be liberally paid. Competent men could be secured and retained for this work if the place were as non-political as possible.

Each district commission should have power to act as a board of review for the public service bodies of the

states in the district. Each should have jurisdiction over interstate questions with power to initiate action when the states have not provided effective remedies. As a whole they should be charged with the duty of favoring water-power development, whenever it is economically desirable to do so.

In case such a system of district commissions is set up the district commissions should be subject to a unifying commission similar in make-up, but with wider powers than those enjoyed by the present Federal Power Commission. This body should issue licenses for the development of water-power projects and prescribe conditions of tenure and operation as the Federal Power Commission does now. It should bind the entire system together in the national interest, harmonize sectional differences, and look to the best use of the resources for the benefit of the entire country.

There is such a close relationship between water-power and steam-power interests that the same rules might well be made to apply to both. The two are so closely bound together that it is embarrassing for the Federal Government to regulate the one without supervising the other. The Federal Government cannot escape the responsibility its water-power activities have thrust upon it. Activity in the power field is not an argument that the

Federal Government should enter into the public utility field generally or that it should ignore and override the rights of the states, but merely that it should be willing to do whatever must be done and some things it can in all probability do better than they can be done by the states.

Studies made as a part of the program for the elimination of waste in industry have shown that it is undesirable to deal with water-power by itself. Mr. Hoover and his superpower surveys are to be thanked for whatever progress has been made towards this newer and large power policy.

Now let us return from the field of speculation regarding what may be done in the public interest, when power is considered in a general way, in order that we may consider some of the salient features of the major projects now being considered or constructed and the policies that have grown up in connection with them.

## CHAPTER X

### THE GREAT POWER PROJECTS

Recently the public has been hearing a great deal about the power possibilities of five great river systems in the United States. Priest Rapids and the Dalles of the Columbia, Lee's Ferry of the Colorado, Long Sault Rapids of the St. Lawrence, Niagara Falls, and Muscle Shoals are widely known and their names are all but household words in this day of synthetic fertilizers and politicians who own newspapers. If we are to believe the press, some adverse law or a lack of favorable legislation holds these greater power sites from use and keeps the farmer or some other large voting class from reaping the benefits that would accrue if the five great rivers were developed.

This all sounds very well and their arguments are prophetic, but with the exception of Niagara Falls, which is the best location for power development to be found anywhere in the world, there is not another of the really great water-power projects in the United States that private interests are willing to develop at this time. A number of large projects are now under construction, but with one exception, at Muscle Shoals, not one of the great rivers is being worked upon. The Southern California Edison Company is making a large development at Big Creek.

The San Joaquin Light and Power Corporation is developing the Kings River. The Yuba River Power Company is constructing a hydro-electric plant on the Yuba River. Several other projects capable of generating a hundred thousand horsepower or more are either under construction or being considered; but none of those mentioned are as large as the developments that will ultimately be made in the Niagara, the Columbia, the St. Lawrence, the Colorado, and the Tennessee rivers. Power plants at Niagara Falls and the government works at Muscle Shoals constitute the sum total of the present development in the major river systems. Many plans have been drawn up, and the newspapers have given the conspicuous <sup>large</sup> river projects a great deal of publicity, but no dams have been built or works constructed in them.

There are a number of reasons why giant projects have not been developed and put to all the uses that have been prophesied. There must always be a time of beginning, but some work would have been done had not certain things stood in the way. If Niagara Falls is omitted from the list, the major reasons for lack of development are common to all the others.

In the first place, works constructed in these rivers will be costly. Not only will the aggregate expenditure needed to construct the works be large, but also

the unit cost of the power generated will be high. The latter cost is far more important than the former. None of the major developments proposed for these rivers will cost less than a billion dollars, with the exception of the Muscle Shoals project, and even its cost of construction is mounting up to an imposing total. The generating works necessary for the complete development of the Colorado River may cost several billions of dollars by the time they are completed. The Colorado is a treacherous and little known river which has made exploration work both hazardous and expensive. It has been necessary to send expeditions down stream through the gorge, in order to navigate it at all, and few of the exploring expeditions have been successfully completed without the loss of life or equipment. The expedition that succeeded in navigating the river in the summer of 1923 secured much valuable information regarding the contour of the river and something with regard to the difficulties to be expected, whenever an attempt is finally made to conquer this untamed giant, but the information is still too meager to justify any heavy outlay for development. Suitable locations for dams have not been found because of the lack of knowledge of the rock formations under the bed of the stream. Core drilling at Lee's Ferry showed that the loose material in the river bed was much deeper



than had been estimated. At Boulder Canyon, it was expected to find bed rock thirty or forty feet below the surface, whereas borings showed that the depth was over a hundred feet.<sup>1</sup> When suitable locations are finally found the materials for constructing the works must be brought long distances and let down the side of the canyon by some means or other that will, in all probability, be expensive to effect. Machinery and supplies must be brought in the same way. Obstacles do not tend to make development of water-power projects less expensive. After the works are constructed, it will be necessary to transmit the power a long distance to market. There is no market for power near the river, nor is there likely to be any appreciable market development near it. Some of the power may be used for railroad electrification, but the local rail traffic in this section of the country is light and not much power will be needed by the transcontinental roads. Most of the power must be sold elsewhere. The transmission lines to transport power to Southern California and other points will cost almost as much, if not more than, the river developments proper and will be expensive to maintain. There is little hope of being able to secure cheap power from the Colorado River.

<sup>1</sup>Federal Power Commission, Second Annual Report, pg. 186, 1922.

Power is not the only consideration. It is desirable that the flow of the river be regulated and controlled in order to maintain an even flow for power, but it is more desirable to be able to curb the great floods which now devastate a large area that otherwise might be profitably irrigated. If the urgent need for the regulation of the flow of the river is to be met it will be necessary to construct huge storage dams to back the water up in the canyons so that it may be let out gradually and uniformly throughout the year. Unless storage is provided for the river it cannot be successfully used for either power or irrigation. Several storage projects have been considered. Each would be costly in the first instance, but the serious problem lies in the fact that the heavy burden of silt carried will render storage basins useless in a few years. When the silt has encroached upon the reservoirs to an extent where they will not control the river any more, it will be necessary to build the dams higher or to construct new ones elsewhere. The rate of reservoir silting in the Colorado River can be judged from the estimates of the Reclamation Service which put the silt flow at Boulder Canyon at 88,000 acre feet per year.<sup>1</sup> The necessity to construct higher and higher dams will persist as long as the watershed of the Colorado

<sup>1</sup>Federal Power Commission, Second Annual Report, pg. 182, 1922.

River system is bare of forests or grass. A great deal of capital would be necessary to completely develop the Colorado River and would entail an interest burden that probably could not be carried at present power rates. Difficulties in the way of developing the Colorado River are numerous and perplexing, but the Columbia projects are little, if any, better.

### THE COLUMBIA RIVER

It is doubtful whether the power possibilities of the Columbia River are any better known than are those of the Colorado. Unlike the Colorado, the power development in the Columbia will depend upon volume of flow, rather than upon a high head at the generators. The dams necessary for the power installations in the Columbia River will, in all probability, contain more masonry than any now constructed, as they must be very long to breast the river. Priest Rapids and the Dalles must turn out a vast amount of power to pay the interest charges upon the investment necessary to secure it. Oregon and Washington are well supplied with smaller streams that can be harnessed much more cheaply than the Columbia and many have already been put to work. Water-power in the Northwest is overdeveloped now and with the present feeble demand

for new power continuing, as it will for some time, the Columbia is likely to be unharnessed for many years.

### THE ST. LAWRENCE RIVER

Market conditions are somewhat different in the Eastern part of the United States, yet capitalists have not been eager to attempt the development of the many projects proposed for the Saint Lawrence River. Although it is capable of generating a large amount of power and at somewhat lower costs than the other two streams, due to the regular flow; yet the most sanguine estimates do not provide for any use of the Saint Lawrence River before 1930. Others are not so certain that it will be used that soon, because of Canada's interest in the stream and the very effective competition from steam plants, which must be met, whenever development is effected.

### MUSCLE SHOALS

The tale of the Tennessee River and of Muscle Shoals is such a long and sad one that it cannot be related in detail with the limited space here available, although some of the high spots are of interest, and may be presented.

Sometime before 1824, the State of Alabama con-

ceived the notion that the Muscle Shoals obstruction in the Tennessee River should be removed by means of a river improvement. Accordingly, the Alabama legislature passed an act for the improvement of the Tennessee River which was sanctioned by Congress, May 13, 1824.

Apparently, the National Government had nothing more to do with the matter until May 23, 1828, when a grant of 400,000 acres of land was made to the State of Alabama by Congress. Alabama was to sell the land and use the proceeds for the improvement of navigation at Muscle Shoals. The land was given with the provision that improvements were to be started within two years from the date of the grant. A time extension was made by the Act of April 24, 1830, in order that work might be deferred until December 1, 1830.

Congress passed an Act, February 12, 1831, to the effect that the engineers of the United States Army should furnish the plans and prescribe the conditions for the development at Muscle Shoals.

By the Act of March 2, 1833, the Alabama Commissioners were permitted to concentrate their effort on one part of the project, and were thus permitted to work on the canal between Lamb's Ferry and Campbell's Ferry until it was completed.

June 23, 1836, Congress passed another act which

permitted the State of Alabama to sell the lands ceded in the original grant without any restrictions with respect to the price that should be charged for them.

In the Act of June 9, 1860, Congress allowed a claim of \$1,350. for work done in the Tennessee River by a man named Calloway. June 12, 1860, \$50,000. was voted for an audit of the Tennessee River Project. Finally, January 13, 1879, Congress allowed the claim for the construction of Locks 2, 3, and 4 at Muscle Shoals.

Thus it is shown how the Federal Government gradually took over the navigation project at Muscle Shoals.

Apparently, the projects constructed as a result of over fifty years of effort proved adequate to the needs of transportation, as little or nothing was said about the Tennessee River until the time of the Great War. The South had been developing along industrial lines since the Civil War, but whatever power was needed was more easily secured by developing the smaller streams or by steam-plants than by attempting to harness the Tennessee River at Muscle Shoals.

This restful condition was changed by the Great War. Certain military leaders had long looked on the Tennessee River as a possible source of synthetic nitrates to be used for the manufacture of explosives. The Tennessee River is especially adaptable to military plans because

it is within the theoretical secondary lines of defense and can be reached neither by the guns of a hostile fleet nor by an army which might drive in from an enemy country. Accordingly, in 1918 Congress entered into a plan for developing the power that might be taken at Muscle Shoals. The great plant which was started at that time is now being rapidly completed. It will generate power in the summer of 1925, six years after the end of the war.

Building the plant has proved to be but one of the difficulties connected with it, if one attaches any significance to the futile efforts of Congress to find some one who is willing to run it. At present power rates, it is doubtful whether any company could make a decent showing there had it constructed the works. The magnificent plant is a monument to the economic folly of the war and, although, the plant will be used and the surrounding country will feel the effects, it is not likely to pay its way for years.

One who loves the whirr of the great generators can see in it a more fitting memorial than a great pile of cold marble would have been, but from a financial point of view, it was constructed much too soon. Many conservationists would have approved it though the cost had been twice what it was. They would have considered such a plant a bargain at almost any price, since it will save

millions of tons of coal. It matters not to them that saved coal will not become valuable until those now living will be long dead.

The present development at Muscle Shoals consists of dam number one which will provide primary horse-power of 241,000 and 850,000 secondary horse-power available six months out of the twelve and the remains of a cyanamid plant which was to have furnished nitrates had the war lasted two or three more years. It is estimated that many thousand tons of fertilizer per year can be made at the plant to be used in connection with the power development and that the fertilizer can be sold much <sup>more</sup> cheaply than fertilizer now marketed in that area.

The fixation of nitrogen is still in the experimental stage and very costly by the known processes. Few men know much about it and no company in the United States has had any extensive experience in the business; yet Congress is insisting that the Muscle Shoals project be devoted, almost exclusively, to the manufacture of synthetic nitrates. It will require an investment of many millions of dollars in plants and experimental laboratories and many more will have to be spent in experiments before anything definite is known about fixation processes, either from a financial or technical standpoint. Apparently, no company is willing to undertake the use of the Muscle



Shoals project under the terms Congress insists upon. Unless it is possible for a company to use the major portion of the power for other purposes and experiment on nitrate fixation on the side, it is evident that the Federal Government will be compelled to make whatever fertilizer Muscle Shoals is capable of turning out. It would be utterly folly for a private corporation to venture into an untried field on as large a scale as Congress contemplates.

For the last three years, Congress has been trying to turn Muscle Shoals over to private interests, but without success. The power plant is rapidly being completed and will be ready to deliver power sometime during the summer of 1925. Hence, Congress must decide to give the plant away soon or else turn it over to a government bureau. Senator Norris of Nebraska introduced a bill in the last session of Congress to provide for the creation of a corporation to manufacture fertilizer and sell the surplus power. Congress did not see fit to pass the bill. It seems almost certain that someone will make nitrates at the Shoals and it is practically as certain that, whether it is done by the Federal Government or by private concerns, some of the cost will come out of the pocket of the people. Whichever course is followed, Congress is likely to continue to meddle with Muscle Shoals. It is equally likely that Congress will meddle with the other great pro-

jects as long as two factions contend for their use. Political preferment may be secured by favoring one or the other of these interests and it would be odd indeed if Congressmen were to abandon this fertile field.

### THE GREAT PROJECTS ONCE MORE

Giant projects are not only handicapped because of their size and the cost of developing them, but also because they may be put to more than one use. Navigation improvements in the Saint Lawrence River, which are to be made in connection with the power developments, will cause the power interests little trouble and will be of small consequence as retarders of development, except as revenue from them must be used to defray a part of the cost of the works. The same holds true for the Tennessee River, which may be a highway for barges and other forms of river traffic, if railroad competition is not too severe.

The possibility of multiple or alternate use raises an almost insurmountable barrier against the development of the Colorado and Columbia rivers. Power projects and irrigation works are competitors for the water of these two rivers. The power and irrigation interests are bitter enemies and both are strongly entrenched politically. Each river is capable of watering a large area in its valley, or nearby, and each is near a great body of land in

need of irrigation. Neither can do both to a maximum degree. The Federal Power Commission must ultimately decide on the division of the water between the two uses, before any work can start. Allocation of water to the various users will be a nice job in view of the delicate balance of power between the two interests. Most governing officials and courts prize the settler more highly than the dynamo with the result that whatever division is finally made will likely favor the settler. Officials of the states through which these rivers flow are imbued with the notion that it is to their interest to provide a place for as large a population as possible, and the consensus of opinion seems to be that the irrigation ditch will provide for a larger and more desirable population than the transmission line will support. Water-power, therefore, holds second place in their affections. Very elaborate studies of the possibilities of the various uses of water must be made in order to know what to do and there must be diplomatic handling of the problem in order to put the findings of such reports and studies into operation. The task will be doubly difficult in cases where irrigation is found to be the less desirable use.

Another problem which differs from the second in form only is that each stream flows through or by several states or is international. The Colorado River affects

the interests of seven states in the United States and two in Mexico. Some of these states are in a much more advanced industrial and agricultural stage of development than are others. Those which are more advanced are in a position to make use of a portion of the water, almost immediately, whereas others may take <sup>many</sup> ~~thirty~~ years to do so. Arizona is not willing to permit other states to use the water to their full capacity, because under the law of prior appropriation, which obtains in the district, once these rights are set up they will continue regardless of what she may do. If Colorado and California are allowed to use all the water of the Colorado River for irrigation, during the time when Arizona is not in a position to do so, their right to such use will be established and Arizona will be unable to make use of the waters at a later date. This very consideration has held up the ratification of the Seven-State Colorado River Compact drawn up by Secretary Hoover. Thus, dog-in-the-manger tactics have been used by Arizona to keep other states from using something she cannot use until agricultural prices are higher than at present.

A difficulty very similar to the above is that caused by the opposition of the various states to the development of power destined to be transported to other states. Arizona objects to the generation of electric power within

her borders in order that Southern California may be further developed thereby. There is evidence that the political situation is such that the Federal Power Commission has not desired to issue permits which involve such disputes, nor is it likely to do so until much more information is available than at present, so that its decisions can bear the weight of authority. No damage is being done by this policy.

The Columbia is a bone of contention between those who want power and those who want settlers. Much the same feeling exists there as in the other area with the exception that Canada is also interested. The Canadians are in a somewhat better position to secure favorable terms than is true of Mexico, but in either instance treaties must be negotiated and lived up to.

The Niagara River is the only one of the international streams that is now being used for power generation. It is but partially developed due to a treaty agreement between the United States and Canada which limits the amount of water each may take above the rapids at Niagara Falls. The Burton Treaty was negotiated at the urgent behest of those who desired to preserve the natural beauty of the place and keep it undefiled by gross commercialism. This cause is worthy, as there is no more magnificent sight in the world, but the people of the United States and

Canada pay a handsome price for the privilege of looking at it.

Forty million tons of coal must be burned each year because Niagara is allowed to run. Several plans have been proposed as compromise measures that would preserve the beauty of the Falls and at the same time allow the use of an amount of power somewhere near the capacity of the river. One of these plans proposed the construction of a gigantic weir to make the water flow over the Falls at a constant depth, instead of in a very heavy mass in the Canadian Falls, as it does normally. This form of development would allow the use of eighty per cent of the flow without any appreciable diminution in the apparent flow over the Falls. A second plan was based upon the idea that the Falls could be fully utilized with the understanding that at certain hours of the day, or during specified days in each month, the power should be shut off and the water allowed to pursue its natural course. This second plan is less desirable than the first, because many of the industrial processes that require power would suffer when the power at Niagara Falls was shut off and could not be used under such conditions without a heavy steam stand-by to carry on the load. It would require a large amount of steam stand-by, since it would have to take over some four or more millions of horsepower when the turbines

were shut down. Interconnection would lower the amount needed, because periods of shut down would normally come in the day time, when the power load would be light. The remainder of the superpower system might be able to carry the load without a great deal of aid from auxiliary equipment.

The third plan is the one being followed at present. Power companies operating at Niagara Falls are constructing or have constructed plants and works to utilize very nearly the total fall of the water between Lake Erie and the gorge below the Falls. Water to be used for power is taken from the river far above the rapids and carried to the generators by means of a canal which has a much smaller gradient than that of the river. Several hundred million dollars have been spent upon the new plants and more expenditure is to be made in an effort to wring the last bit of power from the water allotted by the treaty.

Fifty-six thousand second-feet are now taken above the rapids in the Niagara River. Canada is entitled to thirty-six thousand feet and the United States to twenty-thousand feet. The lion's share goes to Canada principally because of the diversion of water from Lake Michigan through the Chicago Drainage Canal and the fact that by far the major portion of the water goes over on the Canadian side. Thus, the difficulties pile up.

The Federal Power Commission has studied the giant power projects, but otherwise it has left them strictly alone. No leases have been granted or plans worked out that would indicate what form of construction would be best; at least there are none upon which the Commission is willing to take a stand. Congress is in part responsible for the present situation, because it has kept down the personnel and the appropriation of funds for the Federal Power Commission. The reason for this congressional policy probably lies elsewhere than in this old maxim, "Measure your cloth eight times for you may cut it but once."



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